Clemson University
3 1604 011 399 583

I 19.8: 1925pt.

Digitized by the Internet Archive
in 2013

http://archive.org/details/mineralresources011925

DEPARTMENT OF COMMERCE
HERBERT HOOVER, SECRETARY

BUREAU OF MINES
SCOTT TURNER, DIRECTOR

MINERAL RESOURCES

OF THE

UNITED STATES

1925

FRANK J. KATZ
Chief Engineer, Division of Mineral Statistics

PART I—METALS

Clemson College Library
Government Publications

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON
1928

ADDITIONAL COPIES

OF THIS PUBLICATION MAY BE PROCURED FROM
THE SUPERINTENDENT OF DOCUMENTS
U. S. GOVERNMENT PRINTING OFFICE
WASHINGTON, D. C.
AT
$1.25 PER COPY

SUMMARY OF CONTENTS

	Page
Aluminum. *See* Bauxite and aluminum.	
Antimony	7–15
Beneficiation of low-grade ores	14
Domestic production	8
Imports and exports	9
Introduction	7
Metallurgy	14
Recovery of secondary antimony	8
Smelter production of antimonial lead	8
Summary of world situation	15
Tariff history	14
Uses	10
World sources	11
China	12
General statement	12
Reserves	13
United States	11
Arizona, mine report on gold, silver, copper, lead, and zinc	563–600
Metallurgic industry	569
Mining industry	569
Production	563
Ore	563
Review by counties and districts	572
Cochise County	573
Coconino County	578
Gila County	578
Graham County	583
Greenlee County	584
Maricopa County	584
Mohave County	585
Pima County	588
Pinal County	590
Santa Cruz County	593
Yavapai County	594
Yuma County	599
Arsenic	31–34
Arsenic market in 1925	33
Demand and supply	33
Prices	33
Imports	32
Production	31
World's production	33
Bauxite and aluminum	17–29
Alumina cements	29
Aluminous abrasives and refractories	29
Aluminum	24
Domestic production—imports and exports	24
Foreign aluminum industry	27
Canada	27
England	27
France	27
Germany	27
Italy	28
Spain	28
Market and prices	26
Aluminum salts	28
Bauxite	17
Bauxite in foreign countries	23
World's production	23
Africa	24
France	24
Guiana	24
Hungary	24
Yugoslavia (Montenegro)	24
Bauxite in the United States	20
Alabama	22
Arkansas	22
Georgia	23
Mississippi	23
Tennessee	23
Utah	23
Domestic production—imports and exports	17
Market and prices	19
Bauxite producers in the United States in 1925	19
Consumers of bauxite in the United States in 1925	20
Total bauxite production of the United States	18
Bismuth	A25
Cadmium	A26
California, mine report on gold, silver, copper, lead, and zinc	291–318
Metallurgic industry	297
Mining industry	300
Production	291
Ore	292
Review by counties	303
Alpine County	305
Amador County	305
Butte County	305
Calaveras County	306
Del Norte County	307
Eldorado County	307
Fresno County	307
Humboldt County	307
Imperial County	307
Inyo County	308
Kern County	308
Lassen County	309
Los Angeles County	309
Madera County	309
Mariposa County	309
Merced County	310
Modoc County	310
Mono County	310
Monterey County	310
Napa County	310
Nevada County	310
Orange County	311

California, etc.—Continued.
Review by counties—Continued. Page
Placer County 311
Plumas County 312
Riverside County 312
Sacramento County 313
San Bernardino County 313
San Diego County 313
San Luis Obispo County 314
Shasta County 314
Sierra County 314
Siskiyou County 315
Stanislaus County 316
Trinity County 316
Tuolumne County 317
Yuba County 318
Central States, mine report on silver, copper, lead, and zinc 255–289
Introduction 255
Ore 255
Production 256
By States 259
Arkansas 259
Illinois 261
Iowa 264
Kansas 264
Kentucky 268
Michigan 269
Missouri 271
Oklahoma 279
Wisconsin 286
General statistics 256
Chromite 127–147
Chromite deposits by States 135
Alaska 135
California 136
Montana 140
North Carolina 140
Oregon 140
Pennsylvania-Maryland 141
Washington 142
Wyoming 142
Chromite mining in the United States 132
Summary 133
Discovery and properties of chromium 127
Uses 128
As a refractory 129
Chemical uses 129
Metallurgical uses 128
Other possible uses 129
Foreign sources of chromite 142
Australia 142
New South Wales 142
Queensland 142
Tasmania 143
Canada 143
Cuba 143
Greece 144
Guatemala 144
India 144
New Caledonia 145
Rhodesia 145
Russia 146
South Africa 146
Natal 146
Transvaal 146
Chromite—Continued.
Foreign sources of chromite—Continued. Page
Turkey 146
West Africa 146
Togoland 146
Formation and occurrence of chromite 130
Imports 134
Introduction 127
Political and commercial control 131
Prices 147
World's production 130
Cobalt. *See* Rare metals.
Colorado, mine report on gold, silver, copper, lead, and zinc 701–730
Metallurgic industry 707
Mining industry 703
Production 701
Historical record 701
Ore 701
Review by counties and districts 711
Adams County 712
Arapahoe County 711
Boulder County 712
Chaffee County 712
Clear Creek County 713
Custer County 714
Dolores County 714
Douglas County 715
Eagle County 715
El Paso County 715
Fremont County 715
Gilpin County 715
Grand County 716
Gunnison County 716
Hinsdale County 716
Lake County 716
La Plata County 719
Mineral County 719
Moffat County 711
Montrose County 711
Ouray County 719
Park County 720
Pitkin County 720
Rio Grande County 721
Saguache County 721
San Juan County 721
San Miguel County 722
Summit County 724
Teller County 725
Copper, general report 347–408
Consumption 406
General conditions 351
Improvements that have made selective mining possible 353
Milling 354
Flotation 355
Mining 353
Smelting 356
Recent advances in mining and metallurgy 352
Experiments in leaching 353
Some factors that will influence the future of the industry 357
Imports and exports 402
Introduction 347
Prices 408

Copper, general report—Continued. Page
Production 359
Copper sulphate 402
Mine production 361
Production by States 361
Quantity and estimated recoverable content of copper-bearing ores 364
Refinery production 398
Casting and pig copper 399
Electrolytic copper 400
Lake copper 399
Refined copper 400
Review by companies and States 369
Alaska 370
Copper River district 370
Prince William Sound 370
Arizona 371
Ajo district 382
Bisbee district 371
Globe-Miami district 375
Morenci-Metcalf district 379
Pioneer district 382
Ray or Mineral Creek district 381
Yavapai County 380
California 383
Foothill district 383
Plumas district 383
Shasta district 383
Colorado 385
Idaho 385
Michigan 385
Lake Superior district 385
Montana 388
Butte district 388
Nevada 391
Ely (Robinson) district 391
Yerington district 393
New Mexico 393
Burro Mountain district 394
Central (including Santa Rita) district 393
Lordsburg district 394
Scope of discussion 369
Tennessee 394
Utah 396
Bingham district 396
Tintic district 398
Secondary copper 401
Smelter production 359
Stocks 402
Summary of domestic and world statistics 349
Uses 407
Eastern States, mine report on gold, silver, copper, lead, and zinc 1–6
Production 1
Review by States 3
Alabama 3
Georgia 3
Maine 4
Maryland 4
New Hampshire 4
New Jersey 4
New York 4
North Carolina 4
Pennsylvania 5
South Carolina 5
Tennessee 5

Eastern States, etc.—Continued. Page
Review by States—Continued.
Vermont 4
Virginia 6
Ferro-alloys. *See* Iron ore, pig iron, and steel.
Foreign countries, summary of mineral production 441–516
Abyssinia 442
Aden 442
Afghanistan 442
Albania 442
Algeria 443
Angaur Island (Japanese Oceania) 444
Arabia 444
Argentina 444
Australia 445
Austria 450
Basutoland 451
Bechuanaland Protectorate 451
Belgian Congo 451
Belgium 452
Bermuda Islands 452
Bolivia 453
Brazil 454
British Borneo 454
British East Africa 454
British Guiana 455
British Honduras 455
British West Africa 456
British West Indies 456
Bulgaria 457
Canada 458
Ceylon 463
Chile 463
China 464
Colombia 464
Costa Rica 465
Cuba 465
Cyprus 465
Czechoslovakia 466
Denmark 467
Dominican Republic 467
Ecuador 467
Egypt 468
Eritrea 468
Estonia 469
Finland 469
France 470
French Equatorial Africa (Congo) 471
French Guiana 471
French West Africa 472
French West Indies 472
Germany 472
Gilbert and Ellice Islands (British Oceania) 476
Gold Coast and Ashanti 476
Greece 476
Greenland 477
Guatemala 477
Haiti 477
Honduras 477
Hungary 478
Iceland 478
India (British) 479
Indo-China 480
Introduction 441
Iraq (Mesopotamia) 480
Italy 481

Foreign countries, etc.—Continued. Page
Japan 483
Latvia 484
Liberia 485
Libia (Tripoli and Cyrenaica) 485
Lithuania 485
Luxemburg 485
Madagascar 486
Makatea Island (French Oceania) 486
Malay States 486
Mauritius 487
Mexico 488
Morocco 488
Nauru and Ocean Islands (British Oceania) 489
Netherlands 489
Netherlands East Indies 489
Netherlands West Indies 490
New Caledonia 490
Newfoundland 490
New Guinea, Territory of 491
New Zealand 491
Nicaragua 491
Nigeria 492
Norway 492
Nyasaland Protectorate 492
Palestine 493
Panama 493
Papua 494
Paraguay 494
Persia 494
Peru 495
Philippine Islands 495
Poland 496
Portugal 497
Portuguese East Africa (Mozambique) 497
Portuguese India 498
Portuguese West Africa 498
Rhodesia 498
Rumania 499
Russia 500
Salvador 501
Siam 501
Somaliland 501
Southwest African Protectorate 502
Spain 502
Spitsbergen (Svalbard) 504
Surinam (Dutch Guiana) 504
Swaziland 504
Sweden 505
Switzerland 506
Syria 507
Tanganyika Territory 507
Trinidad 507
Tunisia 508
Turkey 508
Union of South Africa 509
United Kingdom of Great Britain, Ireland, and the Isle of Man 511
Uruguay 515
Venezuela 515
Yugoslavia 516
Gold and silver, general report 731–768
Acknowledgments 768
Mine report 738

Gold and silver, general report—Contd. Page
Mine report—Continued.
Distribution of production of gold and silver, by methods of treatment 761
Gold and silver produced at mills, by States 764
Quicksilver and potassium and sodium cyanide used in certain States 766
Summary of distribution 761
Method of collecting statistics 738
Mine production of gold and silver, by States 741
Alaska 741
Arizona 742
Arkansas, Missouri, Oklahoma, Illinois, and Kentucky 742
California 743
Colorado 743
Idaho 744
Michigan 744
Montana 744
Nevada 745
New Mexico 745
Oregon 745
Philippine Islands 747
South Dakota 745
Southern Appalachian and Eastern States 746
Texas 746
Utah 746
Washington 747
Wyoming 747
Mine production of gold, by sources 753
Copper ore 758
Dry and siliceous ores 755
Lead ore 758
Lead-zinc, zinc, and mixed ores 758
Placers 754
Dredging 754
General features 754
Mine production of silver, by sources 759
Copper ore 760
Dry and siliceous ores 760
Lead ore 761
Placers 760
Zinc, lead-zinc, and mixed ores 761
Number of producing mines 748
Ore production, classification, and average value 749
Production of gold and silver reported from the mines 739
Units of measurement 739
Production 731
Domestic production 731
Domestic supply 734
Imports and exports 734
Prices of silver 733
Production of gold and silver since 1792 733
World's production of gold 735
World's production of silver 736
Idaho, mine report on gold, silver, copper, lead, and zinc 517–550
Metallurgic industry 523
Mining industry 517
Production 517
Ore 517

Idaho, etc.—Continued. Page
Review by counties and districts 527
Ada County 529
Adams County 529
Bannock County 529
Bear Lake County 529
Benewah County 529
Bingham County 529
Blaine County 529
Boise County 530
Bonner County 531
Bonneville County 532
Boundary County 532
Butte County 533
Camas County 533
Canyon County 533
Cassia County 533
Clark County 533
Clearwater County 533
Custer County 533
Elmore County 535
Gem County 535
Idaho County 536
Jerome County 537
Latah County 537
Lemhi County 537
Owyhee County 539
Power County 539
Shoshone County 539
Twin Falls County 550
Valley County 550
Washington County 550
Ilmenite 609
Introduction to Mineral Resources of the United States A1–A7
Iron ore, pig iron, and steel 89–126
General review 89
Iron and steel 111
Ferro-alloys 118
Imports and exports 122
Production, shipments, value, and prices 118
Ferromanganese 119
Ferromolybdenum 120
Ferrosilicon 120
Ferrotungsten 121
Ferrovanadium 121
Spiegeleisen 120
Pig iron 112
Average values 113
Foreign trade in pig iron 116
Production by countries 118
Production by grades and by fuel used, total production, and blast furnaces 115
Shipments, value, and production, by States 112
Steel 124
Foreign trade in steel 125
Production 124
Iron ore 90
Beneficiated iron ore 110
Foreign trade in iron ore 107
Imports and exports 107
Iron-ore mining in Cuba 108
Iron ore consumed 98

Iron ore, pig iron, and steel—Contd. Page
Iron ore—Continued.
Iron-ore mining, by States 103
Lake Superior district 103
Iron-ore analyses 103
Michigan 103
Minnesota 103
Wisconsin 103
Missouri 105
Northeastern States 105
New Jersey 105
New York 106
Pennsylvania 106
Ohio 106
Southeastern States 104
Alabama 104
Georgia 104
North Carolina 105
Tennessee 105
Virginia 105
Western States 106
Colorado 106
New Mexico 107
Utah 107
Wyoming 107
Lake Superior district 100
Iron-ore reserves 102
Prices of Lake Superior iron ore 102
Production 100
Shipments and receipts 101
Stocks of iron ore at Lake Erie ports 101
Principal iron-ore mines 94
Production of iron ore, by countries 109
Quantities mined and shipped in 1925 90
Stocks of iron ore at mines 96
Value of iron ore per ton 97
Lead, general report 195–210
Comparison of mine and smelter totals 201
Lead smelters and refineries 201
Production 195
Antimonial lead 198
Lead pigments 198
Mine production 199
Production by States 196
Quantity and value 195
Secondary lead 199
Soft lead 197
Summary 195
Trade conditions 203
Consumption 208
Economic position of the lead industry 204
Imports and exports 205
Prices and value 209
World's smelter production 203
Lead and zinc pigments and salts 149–156
General conditions 149
Imports and exports 152
Prices and value 154
Producers and plants 155
Production 149
Source 151
Manganese and manganiferous ores 157–194
Foreign resources and cost of production 160
Brazil 167
Caucasus, The 161
Georgia 162
Nikopol 161

Manganese and manganiferous ores—Con. Page
Foreign resources, etc.—Continued.
Cuba 170
General statement 161
Gold Coast 169
Dagwin mine 169
Other deposits (Northwest Territory) 169
India 165
Résumé 171
Sinai Peninsula 170
Central Hills 170
East Hills 170
North and South Hills 171
Introduction 157
Manganese and manganiferous ores 158
Classification of manganese ore 158
General statement 158
United States 172
Chemical ores 190
Production 190
Reserves and consumption 190
Uses 190
Ferro-alloys 183
Consumption 187
Prices 186
Production and imports 183
Imports 189
Manganese mining, by States 191
Manganiferous ores utilized in manufacture of manganese pig 189
Cuyuna range shipments 189
Manganiferous residuum 188
Manganiferous silver ore 188
Production 172
Ferruginous manganese ore 182
Manganese ore 176
Manganiferous iron ore 183
Position of the United States 174
Resources of high-grade manganese ore in the United States 174
War minerals relief 174
Mercury 35–51
Consumption and supply 40
Domestic production 36
Domestic reserves 42
Foreign sources 47
Italy 48
Spain 47
Other countries 49
Geological distribution 41
Imports and exports 38
Domestic duties 39
Foreign duties 40
Introduction 35
Metallurgy 42
Mining industry by States 43
Alaska 43
Arizona 43
California 43
Idaho 46
Nevada 46
Oregon 47
Texas 47
Political and commercial control 49
Prices 37
Uses of mercury 42
Potential uses 42
Substitutes 42
World's production 41

Molybdenum. *See* Rare metals. Page
Montana, mine report on gold, silver, copper, lead, and zinc 623–662
Metallurgic industry 632
Mining industry 632
Production 623
Ore 624
Review by counties and districts 636
Beaverhead County 638
Broadwater County 639
Cascade County 639
Deer Lodge County 640
Fergus County 641
Gallatin County 636
Granite County 642
Jefferson County 643
Judith Basin County 645
Lewis and Clark County 645
Lincoln County 648
Madison County 648
Meagher County 651
Mineral County 651
Missoula County 652
Park County 652
Phillips County 653
Powell County 653
Ravalli County 654
Sanders County 654
Silver Bow County 655
Toole County 662
Nevada, mine report on gold, silver, copper, lead, and zinc 663–699
Metallurgic industry 669
Mining industry 668
Production 663
Ore 663
Review by counties and districts 674
Churchill County 675
Clark County 675
Douglas County 677
Elko County 677
Esmeralda County 680
Eureka County 681
Humboldt County 682
Lander County 682
Lincoln County 684
Lyon County 685
Mineral County 686
Nye County 688
Ormsby County 692
Pershing County 692
Storey County 693
Washoe County 695
White Pine County 695
New Mexico, mine report on gold, silver, copper, lead, and zinc 239–251
Metallurgic industry 243
Mining industry 242
Production 239
Ore 239
Review by counties and districts 243
Catron County 245
Colfax County 245
Dona Ana County 245
Grant County 246
Guadalupe County 249
Hidalgo County 249
Lincoln County 249

New Mexico, etc.—Continued. Page
Review by counties and districts—Contd.
Luna County 249
Otero County 250
San Miguel County 250
Santa Fe County 250
Sierra County 250
Socorro County 251
Valencia County 251
Nickel. *See* Rare metals.
Oregon, mine report on gold, silver, copper, and lead 319–327
Metallurgic industry 322
Mining industry 319
Production 319
Ore 320
Review by counties 324
Baker County 325
Coos County 325
Curry County 325
Douglas County 326
Grant County 326
Harney County 326
Jackson County 326
Josephine County 326
Lane County 327
Linn County 327
Malheur County 327
Marion County 327
Wheeler County 327
Pig iron. *See* Iron ore, pig iron, and steel.
Platinum and allied metals 53–63
Consumption 56
Crude platinum 53
Imports and exports 55
Market and prices 57
Crude platinum 57
Refined metals 57
Metallurgy 61
Notes on platinum deposits 61
Australasia 62
Canada 62
Colombia 62
Japan 62
Russia 62
Transvaal 63
United States 61
Proposed statutory definition of platinum 58
Proposed platinum law 58
Refined platinum metals 53
New metals 53
Secondary metals 54
Stocks 57
World's production 58
Prefatory note to the reports on gold, silver, copper, lead, and zinc A121–A123
Quicksilver. *See* Mercury.
Radium. *See* Rare metals.
Rare metals 601–622
Cobalt 601
World's production 602
Molybdenum 603
Imports 604
World's production 605
Nickel 605
Radium, uranium, and vanadium 615
General situation 615

Rare metals—Continued. Page
Radium, uranium, and vanadium—Contd.
Radium and uranium 615
Belgium 615
Czechoslovakia 616
France 616
Portugal 617
Russia 617
South Australia 617
United States 615
Uses 618
Vanadium 619
British Southwest Africa 619
Ferrovanadium 621
Northern Rhodesia 619
Peru 619
Sweden 620
Technology 621
United States 619
World's production 620
Titanium 609
Tungsten 612
World's production 613
Rutile 609
Secondary metals 211–231
Classification of old metals 212
Introduction 211
Recovery of waste material 211
Scope of report 211
Review of the secondary metal industry in 1925 215
Market conditions 215
Prices of some scrap metals and alloys 217
Secondary metals recovered 219
Secondary aluminum 229
Secondary antimony 228
Secondary copper 222
Secondary lead 223
Secondary nickel 230
Secondary tin 225
Secondary zinc 224
Selenium A80
Silver. *See* Gold and silver.
South Dakota, mine report on gold and silver 233–236
Metallurgic industry 233
Mining industry 234
Production 233
Review by counties 234
Custer County 234
Lawrence County 234
Pennington County 236
Steel. *See* Iron ore, pig iron, and steel.
Summary A8–A120
Detailed tables A16
By minerals A16
By States A94
General tables A8
Tantalum A87
Tellurium A87
Texas, mine report on silver and lead 253
Tin 65–88
Domestic situation 67
Alaska 69
California 68
North and South Carolina 68
South Dakota 68

Tin—Continued. Page
Domestic situation—Continued.
Virginia 68
Other States 69
Alabama 70
Connecticut 70
Georgia 70
Idaho 70
Maine 70
Massachusetts 70
Montana 70
New Hampshire 70
Texas 70
Washington 70
Wyoming 70
Export tariffs of British Empire 88
General statement 65
Domestic production 65
Imports and exports 65
Prices 86
British control 87
Smelting 87
Substitutes 77
United States tariffs 88
Uses 70
Babbitt and other bearing metals 76
Bronze 76
Solder 75
Tin foil and other uses 76
Tin plate and terneplate 70
World sources 77
Foreign resources 77
Argentina 86
Australia 83
Belgian Congo 84
Bolivia 80
Burma (India) 83
Cape Province 84
China 81
Czechoslovakia and Germany 85
Dutch East Indies 81
England 83
France 85
Indo-China 84
Italy 85
Japan 85
Malay States 77
Mexico 86
Nigeria 83
Portugal 85
Portuguese East Africa 84
Rhodesia 84
Russia 85
Siam 82
South West Africa 84
Spain 85
Union of South Africa 84
Production 77
Titanium. *See* Rare metals.
Tungsten. *See* Rare metals.
Uranium. *See* Rare metals.
Utah, mine report on gold, silver, copper, lead, and zinc 409–439
Metallurgic industry 413
Mining industry 413

Utah, etc.—Continued. Page
Production 409
Ore 409
Review by counties and districts 420
Beaver County 421
Box Elder County 422
Davis County 422
Garfield County 422
Iron County 422
Juab County 422
Millard County 427
Morgan County 427
Piute County 427
Salt Lake County 428
Summit County 433
Tooele County 436
Uintah County 438
Utah County 438
Wasatch County 433
Washington County 439
Vanadium. *See* Rare metals.
Washington, mine report on gold, silver, copper, lead, and zinc 551–562
Metallurgic industry 555
Mining industry 555
Production 551
Ore 551
Review by counties and districts 557
Chelan County 558
Ferry County 558
Grant County 557
King County 558
Kittitas County 558
Lewis County 559
Okanogan County 559
Pend Oreille County 559
Pierce County 559
Snohomish County 560
Stevens County 560
Whatcom County 562
Wyoming, mine report on gold, silver, and copper 237
Zinc, eneral report 329–346
Production 329
By-product sulphuric acid 334
Comparison of mine and smelter totals 336
Distilled and electrolytic zinc 330
Mine production 335
Primary zinc 329
Rolled zinc 331
Secondary zinc 334
Zinc dust 332
Zinc pigments and salts 333
Summary 329
Trade conditions 338
Consumption 343
Apparent consumption of primary slab zinc 343
Consumption of slab zinc by uses 344
Consumption of slab zinc in hot galvanizing 343
Imports and exports 339
Prices and value 344
World's production 338
Zinc-reduction plants 337

ILLUSTRATIONS

Page

FIGURE 1. World's production of antimony, by years, in metric tons, and New York price of antimony, by months, in cents per pound, 1912–1925 ---- 12
2. Tin ore and metal imported, compared with secondary tin recovered in the United States, 1916–1925, in short tons ---- 67
3. Uses of tin in American industry ---- 76
4. World's production of tin in 1925, apportioned by countries of origin ---- 78

MINERAL RESOURCES OF THE UNITED STATES, 1925—PART I

THE MINERAL RESOURCES OF THE UNITED STATES IN 1925 [1]

INTRODUCTION

By Frank J. Katz
Chief Engineer, Division of Mineral Statistics

In 1925 the mineral industries of the United States, comprising the extraction of the crude earth-products and their conversion into useful materials, shared in and benefited by the general industrial prosperity. Within these industries there were no major disturbances in 1925 except the prolonged suspension of anthracite mining; and save for that check the total value of mineral products of the year would probably closely approach the 1923 value which marks the peak of production if the 1920 inflation of values is discounted.

The total value of mineral products of the United States in 1925 was $5,677,630,000, compared with $5,305,800,000 in 1924, an increase of 7 per cent. The total value of metallic products in 1925 was $1,380,280,000, an increase of 12 per cent over $1,232,330,000 in 1924. Nonmetallic mineral products, other than fuels, produced in 1925, were valued at $1,232,420,000, an increase of 5 per cent over $1,169,100,000 in 1924. The output of mineral fuels, coal, petroleum, natural gas, and natural-gas gasoline, in 1925 had an aggregate value of $3,058,680,000, or 6 per cent more than the value, $2,898,630,000, in 1924.

In 1925 the bituminous coal-mining industry showed an increase in production over 1924 of approximately 36,400,000 short tons, or the equivalent of the average output of soft coal mines for about four weeks. The total production during the year was 520,053,000 short tons, as compared with 483,687,000 short tons in 1924, or an increase of 8 per cent. This increase over 1924 was due in large measure to more settled labor relations in the bituminous industry, and to the strike of the anthracite miners which created a substantial demand for substitutes for anthracite.

[1] In Mineral Resources of the United States the use of leaders (____) indicates that so far as the Bureau of Mines has been able to ascertain there was nothing to report. If data are not available, the fact is indicated by a statement to that effect in a footnote. Leaders are also used in footings where it is quite evident that figures in a column are not addable and in other places where entries are not appropriate.

All figures of imports and exports in this report were compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce, having been converted by Mr. Dorsey to the various units of measurement used in this report and arranged by him in their present form. The imports are those for the calendar year unless otherwise stated. Wherever exports are shown, unless otherwise specified, the figures represent domestic products and not foreign minerals reexported, and they also cover calendar years.

In spite of the increased demand as reflected in the production figures, bituminous prices were at a lower level in 1925 than for several preceding years. The average value of all soft coal produced in 1925 was $2.04 a short ton, and the index figure compiled by Coal Age shows that the average spot price for the year was $2.06 as compared with $2.08 for 1924 and $2.77 for 1923.

During the year, especially in the last months, considerable coal moved into consumers' storage, but the amount was not impressive as compared with figures for previous years. On June 1, commercial stocks of bituminous coal in the United States were estimated at 38,000,000 short tons and at the end of the year at 49,000,000 short tons.

The general drift in the Eastern and Central regions toward greater production in nonunion territory, noted in 1923 and again in 1924, was even more pronounced in 1925. In districts that had formerly been organized as "union" mines were operated as "nonunion." This change was first marked in northern West Virginia, and later in western Pennsylvania. As the change from union to nonunion status was accomplished without serious interruption to production, the general effect was an increase in nonunion tonnage and a corresponding decrease in union production.

Anthracite mining during 1925 was restricted to the first eight months of the year. The miners' strike that began on September 1 and continued until February 18, 1926, was the longest but most peacefully conducted suspension in the history of the industry. Although the suspension was impending for several months, there was no perceptible speeding-up of production until the last three weeks of August. When, on September 1, the miners left the pits, the total production for the year, up to that date, was estimated at 54,747,000 long tons, as compared with 52,900,000 long tons on the same date in 1924. During the remaining four months of the year a negligible quantity of anthracite—about 450,000 long tons—was produced from culm bank and river washeries; no mines were operated. For the entire year the production of anthracite was 55,194,000 long tons, valued, f. o. b. mines, at $327,665,000, as compared with 78,506,000 long tons, valued at $477,231,000, in 1924.

Coke production in 1925 was 51,267,000 short tons, as compared with 44,270,000 short tons in 1924. Both beehive and by-product coke shared in the increase, the production of beehive coke being 10 per cent more than in 1924, and that of by-product coke 17 per cent more than in 1924.

Both the anthracite strike and the activity in the iron and steel industry stimulated the increase in production of both kinds of coke. From September on, there was a strong demand for coke for domestic uses in place of anthracite, and this demand, in addition to the requirements of iron and steel plants and other industrial consumers, created an extensive market. The production of beehive coke in December was almost double what it had been in September at the beginning of the anthracite shortage. The output of beehive coke during the entire year, 1925, was 11,355,000 short tons and of by-product coke nearly 40,000,000 short tons, the largest ever recorded. The nearest approach to this record for by-product coke was 37,600,000 short tons in 1923. More than 74,500,000 tons of coal were consumed in the manufacture of coke in 1925.

The production of crude petroleum in 1925 amounted to 763,743,000 barrels, an increase of 7 per cent over 1924 and of 4 per cent over the previous high figure of 1923. Of the total in 1925, 81 per cent was light oil and 19 per cent was heavy oil.

As in 1924, the lowest daily average production—1,948,000 barrels—was recorded during January. Increases were then recorded for each succeeding month up to June, which had the maximum daily average production of the year—2,241,000 barrels. Production fell off each month thereafter, and the daily average output for December was 11 per cent lower than that for June, but 2 per cent above that for January.

All the major producing areas of the country, with the exception of the Rocky Mountain district and the Central States (Ohio, Indiana, and Illinois), registered gains over 1924. Production in the Mid-Continent field, which produces over half of the total for the country, increased 13 per cent; it is worthy of note, however, that virtually all of this gain was made in States other than Oklahoma, the largest producer in the field. California and the Appalachian area made slight gains.

Among the outstanding developments that sustained the output of crude petroleum in 1925 were the discovery of the Inglewood field in California; the prolific deep sand areas of the Garber field, Oklahoma; the areal extension of and the finding of deep sands in the Smackover field, Arkansas; and the speedy development of the Wortham field in Texas. Inglewood was developed during the summer months and reached its peak of slightly over 100,000 barrels of heavy oil a day in August. Garber was developed during the fall but did not come up to predictions, due to water encroachments. Smackover was the scene of another boom during the spring and early summer, when deeper sands supplying heavy oil figured prominently. Wortham made itself felt during the early part of the year and reached a peak of almost 170,000 barrels a day; it was noteworthy for the speed with which it was developed. Fortunately, the year 1925 was characterized by a well-balanced production, fields being developed in time to prevent decline in output.

Prices of crude petroleum rose during the first part of the year, then remained fairly steady until late summer, when lower prices were posted which remained fairly constant during the rest of the year. The closing prices, however, were considerably higher than those at the beginning. For example, Mid-Continent oil of gravity 33° to 33.9° was $1.10 on January 1, 1925, rose to $1.35 on January 22, to $1.55 on January 30, and to $1.80 on February 12, but fell on August 27 to $1.55, and remained there through December.

The total value at the wells of the output of crude petroleum in 1925 was $1,284,960,000, an increase of 26 per cent over 1924. The average price at the wells was $1.68 in 1925 as compared with $1.43 in 1924. The only State to report an average of less than $1 was Arkansas where, due to overproduction of heavy oil, the average price was only 89 cents as compared with 94 cents in 1924.

The refineries of the United States in 1925 consumed in the manufacture of refined products 739,920,000 barrels of crude petroleum, of which 41,338,000 barrels was foreign crude. This total represents an increase over 1924 of 15 per cent. The refineries continued to meet the larger demand for gasoline by increasing their output over

20 per cent to reach a record total of 259,601,000 barrels. Of this total 41,527,000 barrels, or 16 per cent, was produced on the East Coast; 42,453,000 barrels, or 16.4 per cent, in California; and 64,533,000 barrels, or 25 per cent, in the Mid-Continent field. This increased recovery of gasoline, in spite of a smaller increase of runs to stills, was accomplished by means of improved refinery methods, of which "cracking" is the most important. The production by this method in 1925 was 26 per cent of the total, which represented a marked gain over 1924. The production of gas and fuel oils and of lubricants was 364,991,000 and 31,055,000 barrels, respectively; both figures represent material increases over 1924. The production of kerosene fell off, despite an increase in the use of domestic heaters, many of which will not burn an oil heavier than kerosene. Prices of refined products in 1925 were generally higher than in 1924. In February and in June, the wholesale gasoline price at Tulsa, which is usually accepted as the barometer of refinery prices, passed 13 cents, which was about 1 cent above the high point for 1924. The June increase in the price of gasoline resulted in a repetition of the over-production cycle of the year, and by the end of the year prices had lost most of their early season gains.

The present movement in the refining industry is toward greater efficiency of operation, either by consolidation or improved methods. Keen competition, as emphasized by the present small differential between gasoline costs and prices, has forced the small refiner to either retire from the field or to improve his methods radically. This movement was well illustrated in 1925 by the many installations of cracking equipment by the smaller refiners, by the decrease in number of proposed plants, and, most important, by the junking of many plants that had been idle for some time.

Gold production decreased from $52,277,000 in 1924 to $49,860,000 in 1925, or 5 per cent. Both placers and lode mines—those yielding dry and siliceous ores—shared in the decrease. Utah was the only State to show a largely increased output of gold in 1925, and this increase was from ores and concentrates smelted; very little gold was recovered by amalgamation.

Silver production in 1925 was 66,155,424 ounces, valued at $45,911,864, an increase of 1 per cent in quantity and of 5 per cent in value from 1924. Much of the increase in value was due to the higher price of silver, which was 69.4 cents in 1925, compared with 67 cents in 1924; the higher prices of copper, lead, and zinc, which stimulated production of base-metal ores, also contributed to the increase.

The production and consumption of copper in 1925 largely exceeded the peace-time record of 1924. Consumption was at a much higher rate than production and stocks of refined copper were reduced to about half the amount on hand at the beginning of the year. Both imports and exports were less than in 1924, imports being much smaller.

The year was characterized by a steady rate of production and a very small range of price, the latter averaging close to 14 cents a pound, 1 cent more than in 1924. In view of the substantial decrease in purchasing power of the dollar, copper at this price is selling well below pre-war levels. It is obvious that the recent production has been sustained largely by the high efficiency which characterizes important elements of the industry. Better selling methods and especially

the tendency to integrate mining, metallurgical, fabricating, and distributing agencies have played important parts in this improvement.

The price of lead in 1925 was high, and although it dropped from above 10 cents at the beginning of the year to about 8 cents in the third month it rose again and remained over 9 cents during the last 5 months. Although the simple average of monthly prices was 9.1 cents, the weighted average value of lead sold during the year was 8.7 cents as compared with 8 cents in 1924. This high level was maintained with less fluctuation than in 1924.

Lead production was upheld by the general industrial prosperity and profited notably by the heavy demand from electrical industries for cable sheathing and storage batteries. Much of the increase in output was also attributable to advances in ore dressing, selective and differential flotation, which both augmented recoveries and made available resources heretofore unproductive.

In 1925 the production of refined primary lead in the United States, from domestic ores, amounted to 654,921 short tons, valued at $113,956,000. These figures represent the greatest quantity and highest value for any year in the history of the lead industry of this country. As compared with 1924, they show an increase of 16 per cent in quantity and 26 per cent in value.

The apparent consumption of refined primary lead in the United States in 1925 amounted to 656,000 tons, as compared with a consumption of nearly 603,000 tons in 1924.

White lead in contrast to metallic lead faced a slackening demand in 1925. High price for the metal may account in part for this decline, but perhaps the growing use, regardless of the price of lead, of other white pigments, such as lithopone, is an important factor. Although the total sales of lead pigments were about 2 per cent less in 1925 than in 1924, the decrease was all in white lead. The sales of colored lead pigments increased as did also the average value of the pigments.

The price of slab zinc in the United States dropped from an average of 7.76 cents in January, 1925, to 6.96 cents in May, then rose steadily to 8.72 cents in November, and was 8.71 cents in December. The average of the monthly prices was 7.7 cents and the weighted average of all sales by producers was 7.6 cents as compared with 6.5 cents in 1924. The price was high and the zinc-producing industry was active. The production from domestic ores increased 8 per cent; the total production from all ores 11 per cent; and the apparent domestic consumption of metal about 12 per cent.

Some of the increased production of zinc as of lead was due to the efficiency of the newer methods of ore concentration, and the development of further economies by new metallurgical methods received much attention in 1925.

Sales of zinc pigments in 1925 increased 23 per cent in quantity and 14 per cent in value over 1924. The white zinc pigments, especially lithopone, seemingly have made marked progress as substitutes for lead pigments. Sales of zinc chloride declined but had slightly higher unit value in 1925 than in 1924.

In the iron and steel industry in 1925 a new record was made in the production of steel, due chiefly to the increased demand in building and construction work, the automotive industry, agricultural equipment, and in the canning industry. Although the output

of pig iron was 17 per cent greater in 1925 than in 1924 it did not keep pace with that of steel and it has been exceeded in five previous years, 1923, 1920, 1918, 1917, and 1916. Iron-ore mining had a busy year during 1925, shipments exceeding those of 1924 by 23 per cent. From the shippers' standpoint the price received for the ore was unsatisfactory, for there was no reduction in such mining charges as labor, supplies, and taxes, although the price of the ore was lower. In consequence, many mines operated at a loss and few showed a profit.

The shipments of manganese ore containing 35 per cent or more of manganese in 1925 were much larger than in 1924. This increase was due to the production of 47,507 long tons of rhodochrosite from Montana, containing 38 per cent manganese, which was utilized in the manufacture of ferromanganese. A continuation of such shipments from that area is not to be counted upon. The production is sporadic because the production of manganese ore is secondary to that of zinc ore. The number of shippers of high-grade manganese ore was larger than in 1924. The manganese content of the ore imported for consumption was approximately 280,000 long tons, valued at nearly $7,418,000. The phenomenal increase in the use of manganiferous iron ore was by far the most important development of the year. The shipments of such ore in 1925 were nearly double those in 1924. The growing use of manganiferous iron ore to purify pig iron and add to it a small amount of manganese accounts largely for this increase.

Imports of mercury increased decidedly in 1925. The domestic output was 9 per cent less than in 1924, and supplied 40 per cent of the country's needs. The price of mercury at New York ranged from about $79 to $90; the average for the year was $83.13, or $13.37 a flask higher than the average price for 1924.

The domestic production of chromite during 1925 was even less than that during 1924. Only 108 long tons of domestic ore were shipped. The imports of chromium for 1925 were the second largest in the history of this industry—149,739 long tons of crude ore, and in addition ferrochrome estimated to contain 422 tons of metallic chromium. Only a part of the increased consumption indicated can be attributed to the greater utilization of stainless steel and noncorrosive alloys. The major part of the increase has been utilized in linings for high-temperature blast furnaces and in the manufacture of refractory brick. Chrome brick are in part replacing magnesia brick.

Domestic production of tin in 1925 was practically nil. In 1925 the imports of pig tin were the greatest on record, exceeding the next highest year (1923) by approximately 8,600 short tons. The average price per pound of Straits tin at New York during 1925 was $0.579. The visible supply of tin was lower than it has been for many years. With a maintained demand and at any price heretofore reached in peace time, a world's famine seems inevitable.

The domestic production of antimony in 1925 was negligible, but the consumption during the year has been exceeded only by that of 1917. Control of the antimony supply has remained in the hands of the Chinese. Fear of output being restricted by the political conditions in China resulted in prices being bid higher than for many years. The highest price for 1925 was 24½ cents per pound; the lowest, in April, was 11 cents; the average for the year was 17½ cents. After midyear, save for one week in July and a few days in

September, the price remained above 17 cents and Bolivian production became evident, causing the Chinese shipper to lower prices.

In consequence of the widespread activity in building, the output of all mineral structural materials, except building stone, which showed little increase, increased markedly during 1925. Building lime increased 10 per cent; the value of gypsum and gypsum products 11 per cent. Material for concrete aggregate, including crushed stone, gravel, and sand, was in growing demand, and Portland cement plants, with an increase of 6 in number, established an unprecedented record for production. Shipments of Portland cement exceeded the high total of 1924 by somewhat less than the increase in production and thus the large reserve supply of cement at the mills was increased. A noteworthy feature of this production of materials for concrete aggregate was the growth in the size and number of large plants producing washed or otherwise cleaned crushed stone, gravel, and sand of standardized grading as to the size. Such growth is the consequence of a better understanding of the requirements for good concrete. It has brought about keen competition between gravel and crushed stone and for wide market areas in contrast to the strictly local markets of a few years ago. This competition in turn has developed much discussion and some controversy over zone and commodity freight rates as applied to crushed stone and sand and gravel.

The industries supplying the chief mineral products used in ceramics, namely, clay, feldspar, and silica, had a good year, although without the decided increase of production shown by other products. The value of clay products, of which nearly three-fourths were the structural materials brick and tile, was larger in 1925 than in 1924, and there was a slight gain in the output of clays produced for other ceramic and miscellaneous uses. The output of feldspar fell off, as was expected, on account of the over production in 1924, but it was, nevertheless, 28 per cent larger than in 1923. The production of silica of various kinds, including glass sand, was somewhat larger than in 1924.

Among the mineral chemical materials, including fertilizers, pigments, and metallurgical fluxes and refractories, large increases in output as compared with 1924 were general. The notable exceptions were fluorspar and arsenic. The output of fluorspar in 1925 decreased 9 per cent in quantity and 16 per cent in value, despite the increased activity of the steel industry, which is the principal consumer. The production and supply of arsenic compounds, which had been a matter of grave concern during preceding years, was of less moment in 1925, as the ravages of the cotton boll weevil were far less destructive. Very little calcium arsenate for controlling the boll weevil was made during 1925. Production of white arsenic oxide during the year amounted to about 12,000 short tons and imports about 9,000, which, with the carry-over from 1924, provided ample supply, and prices were lower. Saline materials, including common salt and associated calcium and magnesium chlorides and potash salts, showed large increases of output, but the output of natural sodium sulphates and carbonates decreased. Sales of phosphate rock and sulphur by the producers made large gains, whereas the sales of lime and limestone for agricultural purposes made moderate gains. The sales of limestone for chemical and metallurgical uses showed very large increases.

STATISTICAL SUMMARY

By Martha B. Clark

GENERAL TABLES

Mineral products of the United States, 1924 and 1925 [1]

Product	1924		1925	
	Quantity	Value	Quantity	Value
METALLIC				
Aluminum ..... pounds	----------	$37,607,000	----------	$36,430,000
Antimonial lead [2] ..... short tons (2,000 pounds)	20,787	3,376,713	19,667	3,785,547
Antimony [3] ..... do	2,763	[3] 596,800	2,624	[3] 918,400
Bauxite ..... long tons (2,240 pounds)	347,570	2,137,990	316,540	1,988,250
Cadmium ..... pounds	129,328	77,597	502,824	276,553
Chromite ..... long tons	288	1,140	108	2,105
Copper, [4] sales value ..... pounds	1,634,249,192	214,087,000	1,674,869,886	237,832,000
Ferro-alloys ..... long tons	497,244	43,249,948	616,222	53,048,100
Gold [5] ..... troy ounces	2,528,900	52,277,000	2,411,937	49,860,200
Iron:				
Ore [6] ..... long tons	52,083,375	[6] 151,307,105	63,924,763	[6] 160,796,886
Pig ..... do	31,064,129	665,078,972	36,814,702	739,316,333
Lead (refined), [4] sales value ..... short tons	566,407	90,625,000	664,921	113,956,000
Manganese ore (35 per cent or more Mn) [7] ..... long tons	58,348	1,318,771	98,324	1,857,769
Manganiferous ore (5 to 35 per cent Mn) [7] ..... long tons	898,468	2,739,254	1,448,054	3,752,486
Mercury:				
Metal ..... flasks (75 pounds net)	[8] 10,085	[8] 692,739	9,174	762,616
Ore ..... short tons	70,000	[9]	65,000	[9]
Nickel (value at New York City) ..... do	191	114,903	272	169,664
Ores (crude), tailings, etc.:				
Copper ..... do	49,432,000	[9]	53,262,000	[9]
Copper-lead and copper-lead-zinc ..... do	220,000	[9]	229,000	[9]
Dry and siliceous (gold and silver) ..... do	8,979,000	[9]	8,995,000	[9]
Lead ..... do	8,569,000	[9]	8,560,000	[9]
Lead-zinc ..... do	13,356,000	[9]	17,741,000	[9]
Zinc ..... do	3,160,000	[9]	3,411,000	[9]
Platinum and allied metals (value at New York City) ..... troy ounces	66,007	7,611,319	49,643	5,661,809
Silver ..... do	65,407,186	43,822,814	66,155,424	45,911,864
Tin (metallic equivalent) ..... short tons	7	7,028	14	15,980
Titanium ore:				
Ilmenite ..... do	4,769	76,300	5,566	89,000
Rutile ..... do	----------	----------	46	11,000
Tungsten ore (60 per cent concentrates) ..... do	565	287,000	1,191	755,500
Uranium and vanadium ores ..... do	[10]	[10]	13,070	331,000
Zinc, [4] sales value ..... do	515,831	67,058,000	555,631	84,456,000
Total value of metallic products (approximate)	----------	1,232,330,000	----------	1,380,280,000
NONMETALLIC				
Arsenious oxide ..... short tons	14,453	2,655,015	12,317	1,199,247
Asbestos ..... do	300	42,526	1,258	51,700
Asphalt:				
Native ..... do	562,367	3,958,339	584,850	4,148,400
Oil [6] ..... do	1,158,456	[6] 14,305,007	1,206,700	[6] 15,305,760
Barite (crude) ..... do	196,332	1,540,744	228,063	1,703,097
Borates (colemanite and naturally occurring borax) ..... short tons	116,110	3,183,910	113,700	3,085,660
Bromine ..... pounds	2,033,804	594,685	1,566,120	488,406
Calcium-magnesium chloride ..... short tons	58,791	1,164,848	67,870	1,386,635
Cement ..... barrels (376 pounds net)	147,466,010	266,053,267	159,046,937	281,075,691
Clay:				
Products [11]	----------	415,779,378	----------	423,446,917
Raw [6] ..... short tons	3,691,119	[6] 11,507,536	4,030,420	[6] 12,736,632

[1] In this general statement certain of the figures represent shipments rather than quantity mined. The reader is referred to the following sections on the various mineral products for information in greater detail than it seems practicable to give here.

[2] From both domestic and foreign ores.

[3] Content of antimonial lead. Values excluded from metallic totals as the values of the antimony are included in the antimonial lead values. Value for antimony in 1925 other than that in antimonial lead is included in metallic total; Bureau of Mines not at liberty to publish figures.

[4] Product from domestic ores only.

[5] Value, $20.671834625323 an ounce.

[6] Value not included in total value.

[7] Including ore used for fluxing. For separation see p. A63.

[8] Revised figures.

[9] Figures showing values not available.

[10] Value included in total value of metallic products. Bureau of Mines not at liberty to publish figures.

[11] Figures obtained through cooperation with Bureau of the Census.

Mineral products of the United States, 1924 and 1925—Continued

Product	1924		1925	
	Quantity	Value	Quantity	Value
NONMETALLIC—continued				
Coal:				
Bituminous [12] short tons	483,686,538	$1,062,626,000	520,052,741	$1,060,402,000
Pennsylvania anthracite long tons	78,506,127	477,230,852	55,193,883	327,664,512
Coke [6] short tons	44,269,605	[6] 244,041,561	51,266,943	[6] 262,559,137
Diatomaceous (infusorial) earth and tripoli short tons	91,639	1,083,326	102,418	1,367,167
Emery do	2,195	19,756	769	5,907
Feldspar (crude) long tons	204,772	1,509,339	185,706	1,315,654
Fluorspar short tons	124,979	2,451,131	113,669	2,052,342
Fuller's earth do	177,994	2,632,342	206,574	2,923,965
Garnet for abrasive purposes do	8,290	674,176	8,429	712,853
Gems and precious stones		[13]		[13]
Graphite:				
Amorphous short tons	4,071	38,533	3,536	39,640
Crystalline pounds	1,800,325	48,977	2,257,250	56,721
Grindstones and pulpstones short tons	38,184	1,666,669	37,340	1,705,939
Gypsum do	5,042,629	42,724,507	5,678,302	47,577,240
Lime do	4,072,000	39,596,423	4,580,823	42,609,141
Magnesite (crude) do	120,100	1,041,300	120,660	1,432,700
Mica:				
Scrap do	4,709	87,242	9,695	173,537
Sheet pounds	1,460,897	212,035	1,793,865	321,962
Millstones		30,125		22,490
Mineral paints:				
Natural pigments [14] short tons	[14]	[14]	[14]	[14]
Zinc and lead pigments [15] do	173,859	25,711,159	199,190	28,310,631
Mineral waters gallons sold	[13]	[13]	[13]	[13]
Natural gas M cubic feet	1,141,521,000	253,856,000	1,188,571,000	265,271,000
Natural-gas gasoline gallons	933,861,000	82,233,000	1,127,470,000	120,383,000
Oilstones, etc short tons	1,056	258,943	970	272,224
Peat do	55,469	395,470	72,436	452,898
Petroleum barrels (42 gallons)	713,940,000	1,022,683,000	763,743,000	1,284,960,000
Phosphate rock long tons	2,867,789	10,252,083	3,481,819	11,545,678
Potash (K_2O) short tons	21,880	842,618	25,802	1,204,024
Pumice do	43,651	190,253	40,380	179,020
Pyrites long tons	160,096	645,262	170,081	650,448
Salt short tons	6,803,115	25,747,048	7,397,500	26,162,361
Sand:				
Glass do	2,169,899	3,718,973	2,334,921	3,836,085
Molding, building, etc., and gravel do	154,060,164	93,294,142	169,666,552	103,706,038
Sand-lime brick [11] thousands	283,417	3,334,503	315,595	3,780,639
Silica (quartz) short tons	23,761	203,177	25,444	205,376
Slate do	727,700	11,776,016	724,600	12,575,326
Stone do	103,184,120	161,870,113	115,851,370	174,216,792
Sulphur long tons	1,537,345	25,000,000	1,858,003	29,000,000
Sulphuric acid (60° Baumé) from copper and zinc smelters short tons	874,953	6,996,000	1,006,915	7,512,568
Talc and soapstone do	203,821	3,515,556	[16] 182,256	[16] 2,011,793
Total value of nonmetallic products (approximate)		4,067,730,000		4,291,100,000
SUMMARY				
Total value of metallic products		1,232,330,000		1,380,280,000
Total value of nonmetallic products (exclusive of mineral fuels)		1,169,100,000		1,232,420,000
Total value of mineral fuels		2,898,630,000		3,058,680,000
Total value of "unspecified" (metallic and nonmetallic) products (partly estimated) [17]		5,740,000		[17] 6,250,000
Grand total approximate value of mineral products		5,305,800,000		5,677,630,000

[6] Value not included in total value.
[11] Figures obtained through cooperation with Bureau of the Census.
[12] Includes brown coal and lignite, and anthracite mined elsewhere than in Pennsylvania.
[13] No canvass. Estimate of value included in total value of nonmetallic products.
[14] Canvass discontinued after 1915. Value of iron ore sold for paint included under last item ("Unspecified").
[15] Sublimed blue lead, sublimed white lead, leaded zinc oxide, and zinc oxide.
[16] Figures for 1925 represent talc only. Value of soapstone is included in total value of nonmetallic products; Bureau of Mines not at liberty to publish figures.
[17] Includes for 1925 the value of bismuth, cadmium sulphide and other cadmium compounds, chats ($477,971), flint lining for tube mills and pebbles for grinding ($50,147), iron ore sold for magnets, iron ore sold for paint ($140,986), lithium minerals ($58,500), natural magnesium chloride ($911,440), natural magnesium sulphate ($341,670), calcareous marl ($187,839), greensand marl ($179,788), mineral soap, molybdenum ($450,080), monazite ($120), pyrite radio crystals, selenium ($330,637), silica sand and sandstone (finely ground) ($1,321,250), sodium salts (carbonate, bicarbonate, sulphate, and trona) from natural sources ($1,007,140), tellurium, zircon ($87,360), and an estimate of the value of miscellaneous mineral products, statistics for which are not collected annually by the Bureau of Mines.

Value of mineral products of the United States, 1880–1925

Year	Metallic		Nonmetallic		Unspecified (metallic and nonmetallic)	Total	
	Value	Percentage of increase or decrease	Value	Percentage of increase or decrease		Value	Percentage of increase or decrease
1880	$187,881,000		$173,582,000		$6,000,000	$367,463,000	
1881	189,413,000	+ 0.8	207,207,000	+19	6,500,000	403,120,000	+10
1882	215,820,000	+14	230,786,000	+11	6,500,000	453,106,000	+12
1883	197,881,000	− 8	243,680,000	+ 6	6,500,000	448,061,000	− 1
1884	180,284,000	− 9	221,756,000	− 9	5,000,000	407,040,000	− 9
1885	172,218,000	− 4	242,333,000	+ 9	5,000,000	419,551,000	+ 3
1886	204,400,000	+19	250,995,000	+ 4	790,000	456,185,000	+ 9
1887	240,791,000	+18	294,057,000	+17	785,000	535,633,000	+17
1888	242,010,000	+ .5	310,889,000	+ 6	900,000	553,799,000	+ 3
1889	250,325,000	+ 3	291,004,000	− 6	997,000	542,326,000	− 2
1890	303,440,000	+21	310,995,000	+ 7	994,000	615,429,000	+13
1891	280,485,000	− 8	319,364,000	+ 3	1,000,000	600,849,000	− 2
1892	283,715,000	+ 1	337,517,000	+ 6	1,000,000	622,232,000	+ 4
1893	223,154,000	−21	321,339,000	− 5	1,000,000	545,493,000	−12
1894	186,835,000	−16	362,410,000	+13	1,000,000	550,245,000	+ .9
1895	248,033,000	+33	393,658,000	+ 9	1,000,000	642,691,000	+17
1896	252,075,000	+ 2	387,966,000	− 1	1,000,000	641,041,000	− .3
1897	269,934,000	+ 7	380,678,000	− 2	1,000,000	651,612,000	+ 2
1898	308,247,000	+14	417,795,000	+10	1,000,000	727,042,000	+12
1899	483,521,000	+57	525,575,000	+26	1,000,000	1,010,096,000	+39
1900	513,732,000	+ 6	594,204,000	+13	1,000,000	1,108,936,000	+10
1901	493,314,000	− 4	660,764,000	+11	1,000,000	1,155,078,000	+ 4
1902	604,517,000	+23	722,434,000	+ 9	1,000,000	1,327,951,000	+15
1903	588,753,000	− 3	905,628,000	+25	1,000,000	1,495,381,000	+13
1904	501,114,000	−15	857,667,000	− 5	400,000	1,359,181,000	− 9
1905	702,585,000	+40	920,780,000	+ 7	400,000	1,623,765,000	+19
1906	886,180,000	+26	1,014,500,000	+10	200,000	1,900,880,000	+17
1907	904,108,000	+ 2	1,165,376,000	+15	86,000	2,069,570,000	+ 9
1908	550,768,000	−39	1,040,761,000	−11	244,000	1,591,773,000	−23
1909	754,944,000	+37	1,131,866,000	+ 9	297,000	1,887,107,000	+19
1910	749,879,000	− .7	1,237,668,000	+ 9	297,000	1,987,844,000	+ 5
1911	680,907,000	− 9	1,242,942,000	+ .4	232,000	1,924,081,000	− 3
1912	862,008,000	+27	1,375,420,000	+11	366,000	2,237,794,000	+16
1913	878,869,000	+ 2	1,554,298,000	+13	378,000	2,433,545,000	+ 9
1914	686,639,000	−22	1,424,063,000	− 8	470,000	2,111,172,000	−13
1915	991,730,000	+44	1,400,484,000	− 2	2,430,000	2,394,644,000	+13
1916	1,620,745,000	+63	1,884,413,000	+35	3,281,000	3,508,439,000	+47
1917	2,086,234,000	+29	2,900,462,000	+54	5,800,000	4,992,496,000	+42
1918	2,153,318,000	+ 3	3,380,690,000	+17	6,700,000	5,540,708,000	+11
1919	1,359,744,000	−37	3,232,626,000	− 4	3,400,000	4,595,770,000	−17
1920	1,762,350,000	+30	5,214,170,000	+61	4,820,000	6,981,340,000	+52
1921	654,130,000	−63	3,481,720,000	−33	2,650,000	4,138,500,000	−41
1922	987,180,000	+51	3,656,410,000	+ 5	3,700,000	4,647,290,000	+12
1923	1,510,930,000	+53	4,471,620,000	+22	3,950,000	5,986,500,000	+29
1924	1,232,330,000	−18	4,067,730,000	− 9	5,740,000	5,305,800,000	−11
1925	1,380,280,000	+12	4,291,100,000	+ 5	6,250,000	5,677,630,000	+ 7
Grand total	31,017,750,000		60,053,382,000		105,057,000	91,176,189,000	

Value of mineral products of the United States, 1921–1925, by States[1]

State	1921	1922	1923	1924	1925
Alabama	$52,269,451	$61,723,268	$82,496,430	$77,315,758	$77,139,340
Alaska	17,041,057	19,506,610	20,241,137	17,361,834	18,286,320
Arizona	30,818,363	63,737,720	104,940,213	100,327,062	114,202,670
Arkansas	22,515,412	31,418,633	41,954,319	61,748,999	87,185,532
California	297,025,679	283,411,997	375,492,868	428,175,652	496,923,376
Colorado	54,045,056	54,806,277	61,379,146	61,487,882	63,148,959
Connecticut	4,219,457	5,346,295	7,177,266	8,129,332	6,755,454
Delaware	379,785	428,314	416,074	512,105	539,261
District of Columbia	411,745	869,132	929,768	813,608	954,795
Florida	12,597,948	10,907,718	12,557,822	13,120,295	16,650,659
Georgia	8,650,003	11,120,018	14,300,313	14,946,610	16,503,741
Idaho	16,502,273	18,495,628	27,105,344	27,831,623	31,611,166
Illinois	254,019,136	244,617,561	282,760,623	235,796,027	231,658,604
Indiana	97,700,676	108,394,095	130,885,954	112,299,075	111,833,732
Iowa	35,639,505	36,205,251	46,174,897	40,459,869	38,420,203
Kansas	113,098,346	103,884,561	110,630,255	105,005,476	142,944,214
Kentucky	114,404,662	158,701,496	148,853,786	120,510,775	131,370,840
Louisiana	61,061,974	75,519,328	61,199,048	56,930,681	60,503,891
Maine	4,392,039	5,588,140	7,565,553	6,035,160	5,838,718
Maryland	16,083,965	14,905,227	21,189,542	18,506,867	21,557,810
Massachusetts	9,835,107	11,004,523	14,781,129	15,725,882	16,831,529
Michigan	69,452,819	101,430,981	128,291,450	114,239,386	122,212,254
Minnesota	72,609,973	111,617,448	174,105,328	107,844,680	110,252,956
Mississippi	1,954,353	1,600,393	2,163,343	2,090,422	2,171,945
Missouri	56,375,543	62,402,642	79,201,473	81,054,122	92,548,473
Montana	30,161,734	59,400,591	74,707,269	70,631,806	79,261,284
Nebraska	2,366,287	2,996,587	3,302,397	3,209,425	3,358,585
Nevada	14,038,071	18,374,023	28,598,627	26,225,943	26,469,901
New Hampshire	2,234,007	2,283,119	3,572,615	3,378,165	3,464,837
New Jersey	47,429,290	62,396,379	72,602,066	75,271,009	76,761,313
New Mexico	13,227,268	18,038,022	23,791,047	23,913,528	25,548,804
New York	62,502,458	73,527,880	89,975,134	95,435,299	102,035,557
North Carolina	5,456,479	7,268,381	10,020,559	9,261,467	9,504,063
North Dakota	2,500,349	3,693,095	3,473,018	2,735,477	2,662,029
Ohio	223,533,658	236,808,638	287,868,728	249,049,648	247,506,588
Oklahoma	269,882,786	369,069,612	398,810,630	393,030,665	501,767,118
Oregon	5,199,803	5,489,956	6,054,487	7,364,232	7,826,711
Pennsylvania	944,688,650	823,148,222	1,225,036,404	1,011,630,879	867,196,142
Rhode Island	922,765	770,966	1,022,528	1,132,641	1,151,857
South Carolina	1,754,491	2,414,346	3,550,059	3,444,366	3,507,804
South Dakota	7,498,656	7,278,934	7,372,368	6,925,676	7,971,650
Tennessee	33,754,823	35,146,266	41,553,789	35,354,525	38,869,198
Texas	212,302,907	249,604,173	260,450,913	272,729,023	351,211,629
Utah	40,595,872	60,697,116	86,221,000	84,356,626	100,275,442
Vermont	10,650,213	9,576,636	13,910,449	14,549,429	14,408,933
Virginia	32,810,842	38,551,479	48,052,018	37,962,143	41,038,393
Washington	17,605,878	19,725,303	22,169,191	21,159,370	22,382,132
West Virginia	316,180,647	358,772,116	412,866,535	307,314,205	333,527,697
Wisconsin	9,990,961	13,822,883	19,089,600	15,796,720	19,205,380
Wyoming	51,365,150	58,529,284	77,664,547	75,494,166	78,754,915

[1] In this table iron ore, not pig iron, is taken as the basis of valuation of iron, and in the case of other metals mine production (recoverable content of metals) is the basis.

Mineral products of the United States and principal producing States in 1925

Rank in value	Product	Principal producing States [1]	
		In order of quantity	In order of value
20	Aluminum		New York, North Carolina, Tennessee.
32	Antimonial lead	Not separable by States	Not separable by States.
84	Antimony ore	Nevada, Arkansas	Arkansas, Nevada.
50	Arsenious oxide	Utah, Montana	Rank same as for quantity.
77	Asbestos	Georgia, Arizona and Idaho, Maryland	Arizona, Georgia, Maryland, Idaho.
	Asphalt:		
31	Native	Kentucky, Texas, Utah, Oklahoma	Kentucky, Utah, Texas, Oklahoma.
24	Oil	Not separable by States	Not separable by States.
43	Barite (crude)	Missouri, Georgia, Tennessee, Virginia	Rank same as for quantity.
40	Bauxite	Arkansas, Georgia, Tennessee	Do.
[2]	Bismuth	Not separable by States	Not separable by States.
36	Borates	California, Nevada	Rank same as for quantity.
29	Briquets, fuel	Wisconsin, Pennsylvania, Washington, Virginia	Wisconsin, Washington, Oregon, Pennsylvania.
57	Bromine	Michigan, West Virginia, Ohio	Rank same as for quantity.
61	Cadmium (metal and sulphide)	Not separable by States	Not separable by States.
45	Calcium-magnesium chloride (natural)	Michigan, West Virginia, California, Ohio	Michigan, West Virginia, Ohio, California.
5	Cement	Pennsylvania, Indiana, California, Michigan	Pennsylvania, California, Indiana, Michigan.
58	Chats	Missouri, Oklahoma, Kansas	Rank same as for quantity.
85	Chromite	California, Maryland	Do.
4	Clay products		Ohio, Pennsylvania, New Jersey, Illinois.
25	Clay, raw	Pennsylvania, Missouri, New Jersey, Georgia	Rank same as for quantity.
1	Coal:		
	Bituminous	Pennsylvania, West Virginia, Illinois, Kentucky	Do.
	Pennsylvania anthracite	Pennsylvania	Do.
7	Coke	Pennsylvania, Ohio, Indiana, Alabama	Pennsylvania, Indiana, Ohio, Illinois.
8	Copper	Arizona, Montana, Utah, Michigan	Rank same as for quantity.
46	Diatomaceous earth and tripoli	California, Illinois, Missouri, Oklahoma	California, Missouri, Illinois, Oklahoma.
83	Emery	New York	Rank same as for quantity.
48	Feldspar (crude)	North Carolina, New Hampshire, Maine, New York	North Carolina, New Hampshire, Maine, Connecticut.
15	Ferro-alloys	Pennsylvania, New York, Ohio, Iowa	Pennsylvania, New York, Ohio, Maryland.
78	Flint lining for tube mills	South Dakota, Minnesota	Rank same as for quantity.
39	Fluorspar	Illinois, Kentucky, Colorado, New Mexico	Do.
37	Fuller's earth	Georgia, Florida, Texas, Illinois	Georgia, Florida, Illinois, Texas.
54	Garnet, abrasive	New York, New Hampshire	Rank same as for quantity.
[3]	Gems and precious stones	No canvass for 1925	No canvass for 1925.
16	Gold	California, Colorado, Alaska, South Dakota	Rank same as for quantity.
73	Graphite		Texas, Rhode Island, Michigan, Nevada.
	Amorphous	Rhode Island, Michigan, Nevada	Rank same as for quantity.
	Crystalline	Texas, Montana, Alabama	Do.
42	Grindstones and pulpstones	Ohio, West Virginia, Michigan, Washington	Do.

17	Gypsum	New York, Iowa, Michigan, Texas	New York, Iowa, Ohio, Michigan.
10	Iron ore	Minnesota, Michigan, Alabama, Wisconsin	Rank same as for quantity.
3	Iron, pig	Pennsylvania, Ohio, Illinois, Indiana	Do.
12	Lead	Missouri, Utah, Idaho, Oklahoma	Do.
19	Lime	Ohio, Pennsylvania, Missouri, West Virginia	Ohio, Pennsylvania, Missouri, Massachusetts.
76	Lithium minerals	New Mexico, South Dakota	South Dakota, New Mexico.
44	Magnesite (crude)	California, Washington	Rank same as for quantity.
65	Magnesium	New York, Michigan	Do.
51	Magnesium chloride (natural)	Michigan, California	Do.
62	Magnesium sulphate (natural)	Michigan, Washington, California	Do.
41	Manganese ore	Montana, Washington, Arkansas, Virginia	Montana, Washington, Virginia, Arkansas.
34	Manganiferous ore	Minnesota, Wisconsin, Michigan, New Mexico	Minnesota, Wisconsin, Michigan, Georgia.
67	Manganiferous zinc residuum	New Jersey	Rank same as for quantity.
	Marl:		
69	Calcareous	Virginia, West Virginia, South Carolina, California	Virginia, West Virginia, California, South Carolina.
70	Greensand	New Jersey	Rank same as for quantity.
52	Mercury	California, Texas, Nevada, Arizona	Do.
56	Mica	North Carolina, New Hampshire, South Dakota, New Mexico	New Hampshire, North Carolina, New Mexico, South Dakota.
	Scrap	do	Rank same as for quantity.
	Sheet	New Hampshire, North Carolina, New Mexico, Georgia	Do.
79	Millstones		New York, Virginia, New Hampshire, North Carolina.
22	Mineral paints, zinc and lead pigments	Pennsylvania, Ohio, Illinois, Colorado	Pennsylvania, Ohio, Illinois, Missouri.
(2)	Mineral waters	No canvass for 1925	No canvass for 1925.
60	Molybdenum	Colorado, New Mexico	Rank same as for quantity.
86	Monazite sand	Florida	Do.
6	Natural gas	Oklahoma, California, West Virginia, Louisiana	West Virginia, Pennsylvania, Oklahoma, California.
11	Natural-gas gasoline	Oklahoma, California, Texas, West Virginia	Rank same as for quantity.
72	Nickel	Not separable by States	Not separable by States.
66	Oilstones, etc	Indiana, Arkansas, Ohio, Vermont	Arkansas, Indiana, Ohio, Vermont.
59	Peat	New Jersey, Illinois, California, Indiana	New Jersey, Illinois, California, Florida.
82	Pebbles for grinding	Minnesota, California	Rank same as for quantity.
2	Petroleum	California, Oklahoma, Texas, Arkansas	Oklahoma, California, Texas, Kansas.
27	Phosphate rock	Florida, Tennessee, Idaho, Kentucky	Rank same as for quantity.
30	Platinum and allied metals	Alaska, California, Oregon	Alaska, Oregon, California.
49	Potash (K_2O)	California, Maryland, Pennsylvania	Rank same as for quantity.
71	Pumice	Kansas, Nebraska, California	Do.
55	Pyrites	California, Virginia, New York, Ohio	Do.
23	Salt	Michigan, New York, Ohio, Kansas	Do.
13	Sand and gravel	New York, Illinois, California, Pennsylvania	Pennsylvania, New York, California, Ohio.

[1] Rank of States in metal production (except aluminum, ferro-alloys, and pig iron) arranged according to mine reports, not smelter output. [2] No canvass for 1925.

Mineral products of the United States and principal producing States in 1925—Continued

Rank in value	Product	Principal producing States	
		In order of quantity	In order of value
33	Sand-lime brick	Michigan, Massachusetts, New Jersey, Wisconsin	Michigan, Massachusetts, New Jersey, Florida.
64	Selenium	Not separable by States	Not separable by States.
68	Silica (quartz)	California, Maryland, Wisconsin, North Carolina	Wisconsin, Maryland, California, Massachusetts.
47	Silica sand and sandstone (finely ground)	Illinois, West Virginia, Pennsylvania, Missouri	Illinois, West Virginia, Pennsylvania, North Carolina.
18	Silver	Utah, Montana, Idaho, Arizona	Rank same as for quantity.
26	Slate		Pennsylvania, Vermont, New York, Maine.
38	Sodium salts (other than NaCl) from natural sources.	California, Arizona, Wyoming, Nevada	Rank same as for quantity.
9	Stone	Pennsylvania, Ohio, Michigan, California	Pennsylvania, Indiana, Ohio, New York.
21	Sulphur	Texas, Louisiana, Nevada, Utah	Rank same as for quantity.
28	Sulphuric acid from copper and zinc smelters.	Tennessee, Illinois, Pennsylvania, Ohio	Illinois, Tennessee, Pennsylvania, Ohio.
35	Talc and soapstone	New York, Vermont, Virginia, California	Virginia, New York, Vermont, California.
(1)	Tellurium	Not separable by States	Not separable by States.
80	Tin	Alaska	Rank same as for quantity.
	Titanium ore:		
74	Ilmenite	Florida	Do.
81	Rutile	do	Do.
53	Tungsten ore	California, Nevada, Colorado, Arizona	Do.
63	Uranium and vanadium ores	Colorado, Utah	Do.
14	Zinc	Oklahoma, Kansas, New Jersey, Montana	Do.
75	Zircon	Florida	Do.

[1] No canvass for 1925.

States and their principal mineral products in 1925 [1]

State	Rank	Percentage of total value for United States	Principal mineral products in order of value
Alabama	20	1.55	Coal, iron ore, cement, clay products.
Alaska	33	.37	Copper, gold, silver, coal.
Arizona	11	2.29	Copper, silver, gold, lead.
Arkansas	17	1.75	Petroleum, natural gas, coal, natural-gas gasoline.
California	3	9.97	Petroleum, natural-gas gasoline, natural gas, cement.
Colorado	22	1.27	Coal, gold, lead, zinc.
Connecticut	41	.14	Clay products, stone, lime, sand and gravel.
Delaware	50	.01	Clay products, stone, sand and gravel.
District of Columbia	49	.02	Sand and gravel, sand-lime brick, clay products, stone.
Florida	35	.33	Phosphate rock, stone, sand and gravel, fuller's earth.
Georgia	36	.33	Clay products, stone, cement, fuller's earth.
Idaho	27	.63	Lead, silver, zinc, copper.
Illinois	7	4.65	Coal, clay products, petroleum, cement.
Indiana	12	2.24	Coal, cement, stone, clay products.
Iowa	26	.77	Coal, cement, gypsum, clay products.
Kansas	8	2.87	Petroleum, zinc, coal, cement.
Kentucky	9	2.64	Coal, petroleum, clay products, natural gas.
Louisiana	23	1.21	Petroleum, sulphur, natural gas, natural-gas gasoline.
Maine	42	.12	Stone, lime, clay products, slate.
Maryland	31	.43	Coal, cement, clay products, sand and gravel.
Massachusetts	34	.34	Stone, clay products, sand and gravel, lime.
Michigan	10	2.45	Iron ore, copper, cement, salt.
Minnesota	13	2.21	Iron ore, stone, cement, clay products.
Mississippi	47	.04	Sand and gravel, clay products, stone.
Missouri	16	1.86	Lead, clay products, cement, coal.
Montana	18	1.59	Copper, silver, zinc, coal.
Nebraska	45	.07	Cement, sand and gravel, clay products, stone.
Nevada	28	.53	Copper, silver, gold, lead.
New Hampshire	44	.07	Stone, clay products, sand and gravel, feldspar.
New Jersey	21	1.54	Clay products, zinc, cement, sand and gravel.
New Mexico	29	.51	Copper, coal, petroleum, zinc.
New York	14	2.05	Clay products, gypsum, cement, stone.
North Carolina	38	.19	Clay products, stone, sand and gravel, feldspar.
North Dakota	46	.05	Coal, clay products, sand and gravel, natural gas.
Ohio	6	4.97	Clay products, coal, natural gas, petroleum.
Oklahoma	2	10.07	Petroleum, zinc, natural-gas gasoline, natural gas.
Oregon	40	.16	Cement, sand and gravel, stone, clay products.
Pennsylvania	1	17.40	Coal, cement, clay products, natural gas.
Rhode Island	48	.02	Stone, clay products, sand and gravel, lime.
South Carolina	43	.07	Clay products, stone, sand and gravel, barite.
South Dakota	39	.16	Gold, sand and gravel, stone, gypsum.
Tennessee	25	.78	Coal, cement, clay products, stone.
Texas	4	7.05	Petroleum, natural-gas gasoline, natural gas, sulphur.
Utah	15	2.01	Copper, lead, silver, coal.
Vermont	37	.29	Stone, slate, lime, talc.
Virginia	24	.82	Coal, clay products, stone, gypsum.
Washington	30	.45	Coal, cement, clay products, sand and gravel.
West Virginia	5	6.69	Coal, natural gas, petroleum, clay products.
Wisconsin	32	.39	Stone, zinc, sand and gravel, iron ore.
Wyoming	19	1.58	Petroleum, coal, natural gas, natural-gas gasoline.

[1] In this table iron ore, not pig iron, is taken as the basis of iron valuation, and in the case of other metals mine production (recoverable content of metals) is the basis.

Prices of silver, copper, lead, and zinc, 1916–1925

Year	Silver [1]	Copper [2]	Lead [3]	Zinc [4]	Year	Silver [1]	Copper [2]	Lead [3]	Zinc [4]
	Per fine ounce	*Per pound*	*Per pound*	*Per pound*		*Per fine ounce*	*Per pound*	*Per pound*	*Per pound*
1916	$0.658	$0.246	$0.069	$0.134	1921	$1.00	$0.129	$0.045	$0.050
1917	.824	.273	.086	.102	1922	1.00	.135	.055	.057
1918	.98	.247	.071	.091	1923	.82	.147	.070	.068
1919	1.12	.186	.053	.073	1924	.67	.131	.080	.065
1920	1.09	.184	.080	.081	1925	.694	.142	.087	.076

[1] Average price furnished by Bureau of the Mint.
[2] Average price, all marketable grades.
[3] For 1916, from outside spot quotations at New York. For 1917 and later years, average price.
[4] Average price, all grades.

DETAILED TABLES

ABRASIVE MATERIALS

Natural abrasives sold by producers in the United States, 1916–1925 [1]

Year	Millstones [2]	Grindstones		Pulpstones [3]		Oilstones and scythestones		Emery	
		Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1916	$44,559	50,839	$631,497	(4)	$134,643	(4)	$154,573	15,282	$123,901
1917	43,489	54,432	806,896	(4)	340,888	1,816	168,704	[5] 17,135	[5] 241,050
1918	92,514	56,554	1,262,602	8,785	513,680	1,010	189,033	[6] 10,422	[6] 112,878
1919	66,972	40,755	993,959	6,110	342,056	1,463	235,943	2,601	23,203
1920	63,325	44,832	1,239,990	8,652	467,014	1,144	231,747	2,327	21,685
1921	24,524	16,310	477,259	10,030	750,063	831	173,025	305	2,250
1922	20,853	21,367	574,900	5,157	445,286	1,016	197,450	1,468	17,511
1923	22,229	37,384	1,008,899	9,186	680,416	1,223	231,812	2,286	29,478
1924	30,125	28,991	852,260	9,193	814,409	1,056	258,943	2,195	19,756
1925	22,490	28,970	864,637	8,370	841,302	970	272,224	769	5,907

Year	Garnet		Diatomaceous earth		Tripoli (including rottenstone)			Pumice		Grinding pebbles and tube-mill lining	
						Value					
	Short tons	Value	Short tons	Value	Short tons	Crude (estimated)	As sold (crude and finished)	Short tons	Value	Short tons	Value
1916	6,171	$208,850	[7] 2,721	$26,337	43,257	$215,216	(4)	33,320	$82,263	[8] 6,345	[8] $42,500
1917	4,995	198,327	[7] 3,033	31,368	26,069	92,416	$338,188	35,293	84,814	15,050	131,441
1918	4,696	248,161	[7] 2,965	24,947	19,982	53,815	199,854	30,637	91,178	12,469	129,485
1919	4,944	310,131	42,642	531,960	24,292	98,010	181,541	36,051	116,835	9,448	85,302
1920	5,476	434,425	61,922	1,079,693	40,233	164,076	569,677	41,838	114,433	10,924	77,823
1921	3,048	260,687	55,134	682,616	12,340	53,892	213,013	37,108	158,540	989	14,637
1922	7,054	566,879	44,761	386,669	30,205	105,309	316,728	45,262	175,600	3,159	30,798
1923	9,006	688,437	65,833	699,406	27,082	62,190	382,757	56,575	214,169	4,551	51,795
1924	8,290	674,176	63,163	693,917	28,476	55,537	389,409	43,651	190,253	2,532	37,429
1925	8,429	712,853	73,030	922,281	29,388	58,770	434,886	40,380	179,020	3,831	50,147

[1] For figures on abrasive feldspar and quartz, see sections on feldspar and silica.
[2] Figures for quantity not available.
[3] Exclusive of sales in Washington prior to 1923.
[4] Figures not available.
[5] Includes 820 short tons of corundum, valued at $67,461.
[6] Includes corundum for which figures may not be published.
[7] Exclusive of considerable production for special uses upon which the Bureau of Mines is not at liberty to report.
[8] Grinding pebbles only. Figures for tube-mill lining not available.

Value of abrasive materials imported for consumption in the United States, 1916–1925

Material	1916	1917	1918	1919	1920
Millstones and burrstones	$19,816	$18,227	$20,017	$26,356	$20,954
Grindstones	63,277	57,950	27,361	50,551	77,046
Hones, oilstones, and whetstones	10,614	10,636	6,075	12,199	56,416
Emery and corundum	240,737	210,602	614,167	595,203	617,187
Diatomaceous earth, tripoli, and rottenstone	37,573	17,864	11,128	12,545	16,323
Pumice	116,543	147,278	33,014	119,781	249,995
Diamond dust and bort	67,290	349,746	475,870	1,420,442	3,387,488
Flint, flints, and flintstones, unground	313,120	197,156	127,808	250,096	338,630

Material	1921	1922	1923	1924	1925
Millstones and burrstones	$13,556	$15,356	$20,102	$6,311	$8,413
Grindstones	81,880	81,733	106,028	122,440	124,319
Hones, oilstones, and whetstones	35,761	48,938	53,233	43,579	49,108
Emery and corundum	393,454	389,390	722,688	364,755	313,718
Diatomaceous earth, tripoli, and rottenstone	13,203	10,429	11,779	9,504	6,589
Pumice	173,201	118,458	128,693	111,284	130,460
Diamond dust and bort	466,345	1,029,261	228,409	259,482	760,476
Flint, flints, and flintstones, unground	116,157	145,805	130,974	114,958	105,041
Garnet	(1)	[1] 1,837	93,803	54,402	200

[1] Not separately classified prior to new tariff, Sept. 22, 1922.

Value of domestic abrasive materials exported, 1916–1925

Material	1916	1917	1918	1919	1920
Grindstones	$176,563	$198,772	$210,889	$297,068	$424,322
Abrasive wheels, emery, and other	2,240,227	4,481,600	3,862,531	3,032,067	2,791,128
All other natural abrasives, hones, whetstones, etc	2,035,951	1,941,512	1,982,822	2,809,231	3,810,171

Material	1921	1922	1923	1924	1925
Grindstones	$281,976	$281,413	$499,123	$481,397	$553,750
Abrasive wheels, emery, and other	1,318,804	644,151	571,733	521,840	439,904
All other natural abrasives, hones, whetstones, etc	1,719,810	292,051	342,737	173,731	195,915

ALUMINUM

[See Bauxite and aluminum]

ANTIMONY AND ANTIMONIAL LEAD

Mine production of antimony ores in the United States, 1916–1925, in short tons

Year	Ore	Antimony content	Year	Ore	Antimony content
1916	4,500	1,770	1921		
1917	1,060	390	1922	20	4
1918	190	50	1923	40	10
1919			1924	113	33
1920			1925	123	33

Smelter production of metallic antimony in the United States, 1917–1925 [1]

Year	From domestic ores		From foreign ores		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1917	258	$106,812	2,182	$903,348	2,440	$1,010,160
1918	127	32,004	2,490	627,480	2,617	659,484
1919	----------	----------	(2)	(2)	(2)	(2)
1920	----------	----------	(2)	(2)	(2)	(2)
1925	----------	----------	(2)	(2)	(2)	(2)

[1] Not recorded prior to 1917, and no production reported 1921 to 1924.
[2] Only two smelters reported production (all from foreign ores) in 1919, one in 1920 and one in 1925, and the Bureau of Mines is not at liberty to publish the figures.

Secondary antimony and antimony content of secondary alloys recovered from old alloys, scrap, and dross in the United States, 1916–1925

Year	Short tons	Value [1]	Year	Short tons	Value [1]
1916	4,480	$2,270,016	1921	4,720	$464,400
1917	4,961	2,061,700	1922	7,090	765,700
1918	5,226	1,317,000	1923	8,021	1,252,800
1919	4,399	717,900	1924	9,404	2,025,600
1920	5,600	938,560	1925	10,840	3,794,000

[1] Values calculated at average yearly price for ordinary brands of antimony as published by the American Metal Market.

By-product antimonial lead produced in the United States from both foreign and domestic ores, 1916–1925

Year	Short tons	Value	Antimony content (short tons)	Year	Short tons	Value	Antimony content (short tons)
1916	24,038	$4,483,582	3,496	1921	10,064	$870,059	1,589
1917	18,646	3,781,560	2,759	1922	8,075	844,993	1,441
1918	18,570	2,826,350	2,566	1923	14,190	1,950,370	2,170
1919	13,874	1,513,968	1,943	1924	20,787	3,376,713	2,763
1920	12,535	1,963,255	2,033	1925	19,667	3,785,547	2,624

Antimony imported for consumption in the United States, 1916–1925

Year	Antimony ore [1]			Liquated antimony sulphide [2]		Metallic antimony [3]		Antimony oxides and other compounds [4]	
	Short tons	Antimony content		Short tons	Value	Short tons	Value	Short tons	Value
		Short tons	Value						
1916	7,840	4,622	$1,072,340	----------	----------	7,064	$3,548,507	243	$109,832
1917	10,083	5,832	1,006,884	796	$128,660	11,286	2,829,159	10	5,368
1918	3,363	1,425	177,731	833	113,258	14,011	3,065,619	18	11,904
1919	993	409	54,477	278	19,202	7,159	1,021,587	126	9,501
1920	1,709	682	70,285	1,375	123,902	9,817	1,216,376	298	25,260
1921	213	98	11,682	353	17,577	10,130	784,146	154	15,558
1922	----------	----------	----------	689	40,108	9,344	659,242	379	65,538
1923	(5)	1,047	44,721	835	64,493	6,763	641,804	2,277	288,206
1924	(5)	899	62,999	558	52,393	6,778	840,434	1,207	190,252
1925	1,359	773	47,084	760	115,990	9,857	2,362,915	1,792	349,990

[1] Classified in tariff classification as "Antimony ore and stibnite containing antimony."
[2] Classified in tariff classification as "Antimony matte, containing not more than 10 per cent of lead"; also as "needle or liquated antimony."
[3] Classified in tariff classification as "Antimony regulus or metal."
[4] Classified in tariff classification as "Antimony, oxide, salts, and compounds of."
[5] Figures not available.

Foreign antimony (matte, regulus, or metal) exported from the United States, 1916–1925

Year	Pounds	Value	Year	Pounds	Value
1916 [1]	3,018,251	$761,045	1921	299,776	$15,741
1917	989,477	169,260	1922 [2]	37,218	1,548
1918	1,410,970	164,666	1923	15,958	1,047
1919 [1]	429,059	33,913	1924	279,920	14,441
1920	896,034	51,607	1925	188,976	17,376

[1] Also 231 short tons of antimony ore, containing 255,695 pounds of antimony, valued at $9,874, was exported in 1916, and 3 short tons, containing 5,380 pounds of antimony, valued at $1,665, in 1919.
[2] During 1922 domestic exports of "matte, regulus, or metal" were 224,610 pounds, valued at $13,961. This is the first export of domestic antimony of which there is any record. However, foreign antimony manufactured in the United States and exported would be classed as domestic exports. Similar exports for 1923 to 1925 are not shown.

ARSENIC

White arsenic (refined and crude) sold by producers in the United States, 1916–1925

Year	Short tons	Value	Year	Short tons	Value
1916	5,986	$555,187	1921	4,786	$717,700
1917	6,151	1,118,313	1922	10,027	1,475,229
1918	[1] 6,323	1,213,000	1923	14,271	2,808,801
1919	[1] 6,029	1,181,684	1924	14,453	2,655,015
1920	11,502	2,021,356	1925	12,317	1,199,247

[1] In addition to the arsenious oxide (or white arsenic) elemental arsenic was produced from ore in 1918 and 1919. The totals shown include this elemental arsenic.

Arsenic compounds imported for consumption in the United States, 1916–1925

Year	Arsenic or arsenious acid (white arsenic, As_2O_3)		Arsenic sulphide (realgar and orpiment)		Sheep dip		Paris green and London purple	
	Short tons	Value	Short tons	Value	Pounds	Value	Pounds	Value
1916	1,071	$107,876	1,092	$124,818	[1]	$20,134	23,461	$5,028
1917	1,178	264,534	2,777	410,341	[1]	15,848	48	189
1918	1,847	441,212	4,842	840,600	[1]	23,538		
1919	4,389	624,494	2,151	316,687	146,803	12,346	18	14
1920	3,740	532,635	4,080	684,016	70,168	5,150	772	277
1921	1,669	253,250	3,343	531,322	61,377	6,362	325	123
1922 [2]	1,081	162,494	3,815	472,044	70,390	4,877	3,866	741
1923 [3]	10,152	1,985,400	1,097	268,311	87,739	5,237	100,781	20,586
1924 [4]	8,877	1,597,433	234	45,246	114,801	10,764	76,241	15,683
1925 [5]	9,316	1,076,073	476	63,296	73,477	4,953	2,880	702

[1] Figures not available.
[2] Also 41,296 pounds of "acid," valued at $4,195, and 22,487 pounds of "metallic arsenic," valued at $3,484, imported Sept. 22 to Dec. 31, 1922. Not separately classified prior to new tariff.
[3] Also 166,354 pounds of "acid," valued at $15,597; 174,415 pounds of "metallic arsenic," $37,314; and 26 pounds of "lead arsenate," $9.
[4] Also 420 pounds of "acid," valued at $121; 122,467 pounds of "metallic arsenic," $23,684; 3,585 pounds of "lead arsenate," $525; and 3,172 pounds of "calcium arsenate," $278.
[5] Also 59,112 pounds of "acid," valued at $2,676; 149,018 pounds of "metallic arsenic," $31,918; 10,467 pounds of "lead arsenate," $1,514; and 1,074 pounds of "calcium arsenate," $135.

Foreign arsenic and sulphide of, or orpiment, exported from the United States, 1916–1925 [1]

Year	Pounds	Value	Year	Pounds	Value
1916	1,761	$1,256	1920	13,799	$1,827
1917	113,600	15,840	1921	23,765	2,835
1918	80,050	12,017	1922	14,290	1,555
1919					

[1] Domestic exports not separately recorded. Foreign exports not separately recorded after 1922.

ASBESTOS

Asbestos sold by producers in the United States, 1916–1925, by varieties

Year	Chrysotile		Amphibole		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1916	808	$167,683	830	$13,311	1,638	$180,994
1917	1,391	279,270	567	11,744	1,958	291,014
1918	392	101,059	606	17,628	998	118,687
1919	502	229,265	659	19,000	1,161	248,265
1920	1,245	661,907	403	16,324	1,648	678,231
1921	438	313,268	393	23,700	831	336,968
1922	25	3,320	42	6,800	67	10,120
1923	69	4,433	158	5,193	227	9,626
1924	173	33,941	127	8,585	300	42,526
1925	93	40,750	1,165	10,950	1,258	51,700

Asbestos (unmanufactured) imported into and exported from the United States, 1916–1925

Year	Imports for consumption		Exports	
	Short tons	Value	Short tons	Value
1916	116,162	$3,303,470	[1] 312	[1] $6,133
1917	134,088	4,521,172	708	116,580
1918	137,700	6,337,608	697	51,053
1919	135,270	7,369,685	1,119	157,416
1920	167,558	9,120,253	615	141,071
1921	72,463	2,948,302	520	101,600
1922	149,427	5,144,700	376	49,939
1923	212,420	7,445,143	680	48,525
1924	183,250	5,602,945	1,270	93,163
1925	230,520	7,134,302	1,109	70,846

[1] Figures cover July to December. Not separately classified prior to July, 1916.

ASPHALT AND RELATED BITUMENS

Native asphalt and related bitumens sold at mines in the United States, 1916–1925

Year	Short tons	Value	Year	Short tons	Value
1916	98,477	$923,281	1921	296,412	$1,985,583
1917	81,604	773,424	1922	327,792	2,253,180
1918	60,034	780,808	1923	400,236	2,885,631
1919	88,281	682,989	1924	562,367	3,958,339
1920	198,497	1,213,908	1925	584,850	4,148,400

Asphalt, manufactured in the United States from petroleum, sold at refineries in 1916–1925

Year	From domestic petroleum		From foreign petroleum	
	Short tons	Value	Short tons	Value
1916	688,334	$6,178,851	572,387	$6,018,851
1917	701,809	7,734,691	645,613	7,441,813
1918	604,723	8,796,541	597,697	9,417,818
1919	614,692	8,727,372	674,876	7,711,510
1920	700,496	11,985,457	1,045,779	14,272,862
1921	624,220	9,048,221	908,093	11,761,358
1922	805,145	10,385,925	1,242,163	13,899,407
1923	995,654	13,060,174	1,378,722	16,840,045
1924	1,158,456	14,305,007	1,920,915	21,710,793
1925	1,206,700	15,305,760	1,971,670	27,520,010

Asphalt and related bitumens imported for consumption in the United States, 1916–1925

Year	Crude asphalt		Ozokerite	
	Short tons	Value	Short tons	Value
1916	147,383	$732,917	1,504	$196,185
1917	187,473	978,087	450	90,510
1918	114,686	624,967	905	147,805
1919	104,913	609,923	1,874	454,840
1920	127,027	1,055,951	2,136	499,758
1921	116,450	972,166	4,274	546,054
1922	120,359	940,873	4,495	371,161
1923	138,430	1,046,603	2,428	213,407
1924	156,662	1,165,253	1,557	207,833
1925	113,384	823,165	3,088	361,767

Year	Ichthyol		Bituminous limestone		Total	
	Pounds	Value	Short tons	Value	Short tons	Value
1916	116,738	$93,762	330	$1,795	149,275	$1,024,659
1917	58,397	36,232	413	15,028	188,365	1,119,857
1918	65,752	39,452	39	2,528	115,663	814,752
1919	30,976	38,975	735	5,576	107,537	1,109,314
1920	98,135	79,133	1,387	11,665	130,599	1,646,507
1921	76,020	107,752	12,085	157,124	132,847	1,783,096
1922	74,330	89,150	4,300	59,590	129,191	1,460,774
1923	[1] 20	15	6,205	33,303	147,063	1,293,328
1924	9,300	17,058	3,354	37,906	161,578	1,428,050
1925	560	1,281	8,778	84,259	125,250	1,270,472

[1] As recorded by Bureau of Foreign and Domestic Commerce. Change in classification under new tariff may account to some extent for great decrease.

Native asphalt and related bitumens exported from the United States, 1916–1925

Year	Unmanufactured		Manufactures of (value)	Total value
	Short tons	Value		
1916	40,816	$759,769	$494,895	$1,254,664
1917	30,107	587,256	585,472	1,172,728
1918	22,108	577,654	577,936	1,155,590
1919	40,208	1,103,930	606,918	1,710,848
1920	51,706	1,356,116	842,074	2,198,190
1921	45,367	1,178,038	621,224	1,799,262
1922	57,362	1,344,440	[1] 1,261,125	2,605,565
1923	72,628	1,500,869	[1] 2,075,628	3,576,497
1924	52,568	1,245,670	[1] 2,212,260	3,457,930
1925	32,835	825,654	[1] 2,525,618	3,351,272

[1] Includes value of squares (10 by 10 feet) of roofing asphalt as follows: 1922, 588,636 squares, $870,200; 1923, 783,028 squares, $1,124,491; 1924, 697,293 squares, $998,469; 1925, 661,662 squares, $919,977. Corresponding exports not separately shown prior to 1922.

Exports of petroleum asphalt were not separately recorded until 1925 when 89,014 short tons, valued at $1,762,048, was exported.

BARITE AND BARIUM PRODUCTS

BARITE

Crude barite sold by producers in the United States, 1916–1925

Year	Short tons	Value	Year	Short tons	Value
1916	221,952	$1,011,232	1921	66,369	$531,958
1917	206,888	1,171,184	1922	155,040	1,123,950
1918	155,368	1,044,905	1923	214,183	1,664,156
1919	209,330	1,727,822	1924	196,332	1,540,744
1920	228,113	2,142,464	1925	228,063	1,703,097

Crude barite sold by producers in the United States, 1924 and 1925, by States

State	1924		1925	
	Short tons	Value	Short tons	Value
Georgia	71,776	$574,208	65,936	$475,618
Missouri	77,189	604,390	101,056	794,927
Tennessee	39,643	302,873	47,012	345,038
Other States [1]	7,724	59,273	14,059	87,514
	196,332	1,540,744	228,063	1,703,097

[1] 1924: Alabama, Nevada, North Carolina, South Carolina, Virginia, and Wisconsin; 1925: Arizona, Nevada, North Carolina, South Carolina, Virginia, and Wisconsin.

Crude domestic and foreign barite used in the manufacture of barium products in the United States, 1916–1925, in short tons

Year	In manufacture of—		
	Ground barite	Lithopone	Barium chemicals
1916	75,507	71,898	38,283
1917	60,132	86,065	49,842
1918	62,440	85,282	38,041
1919	64,922	103,688	32,976
1920	79,052	113,181	37,210
1921	28,296	61,359	10,952
1922	48,280	94,259	25,303
1923	47,713	128,547	34,327
1924	42,855	137,127	33,181
1925	56,851	146,693	29,141

Crude barite imported for consumption in the United States, 1916–1925

Year	Short tons	Value	Year	Short tons	Value
1916	17	$245	1921	11,054	$59,371
1917	6	63	1922	23,239	104,680
1918			1923	15,045	93,721
1919	118	594	1924	21,502	104,264
1920	24,874	146,858	1925	28,655	91,016

Exports of barite are not separately reported.

BARIUM PRODUCTS

Barium products, manufactured in the United States from either domestic or imported crude ore, sold in 1916–1925, in short tons [1]

Product	1916	1917	1918	1919 [2]	1920
Ground barite	65,440	52,694	55,086	57,985	65,748
Lithopone	51,291	63,713	62,403	79,643	89,373
Barium chemicals:					
Binoxide	1,980	[3]	[3]	[3]	[3]
Carbonate	6,844	8,238	7,661	7,135	7,484
Chloride	3,643	4,870	4,530	4,509	3,084
Nitrate	446	165	[3]	[3]	[3]
Sulphate (blanc fixe)	3,337	6,314	9,522	5,227	8,046
Other [4]	542	2,916	1,473	3,142	2,146
	133,523	138,910	140,675	157,641	175,881

Product	1921	1922	1923	1924	1925
Ground barite	27,661	46,176	39,605	38,296	49,674
Lithopone	55,016	83,360	98,199	109,469	145,019
Barium chemicals:					
Carbonate	1,956	2,281	6,362	6,058	4,962
Chloride	[3]	2,022	3,301	3,859	[3]
Sulphate (blanc fixe)	2,471	7,349	6,761	7,796	11,748
Other [4]	1,060	2,249	379	441	1,944
	88,164	143,437	154,607	165,919	213,347

[1] In order to avoid duplication of figures, barium chemicals manufactured from other barium chemicals bought in open market are not included in table.
[2] Figures for 1919 represent production.
[3] Included under "Other."
[4] 1916, 1923, and 1924: Hydroxide and sulphide; 1917: Binoxide, hydroxide, and sulphide; 1918 and 1920: Binoxide, hydroxide, nitrate, and sulphide; 1919: Binoxide, nitrate and sulphide; 1921 and 1925: Chloride, hydroxide, and sulphide; 1922: Binoxide, hydroxide, sulphide, and sulphydrate.

Barium products imported for consumption in the United States, 1916–1925

Product	1916	1917	1918	1919	1920
Manufactured barite	$2,072	$1,743			$3,017
Lithopone	405,730	29,199		$122,708	263,240
Barium carbonate:					
Natural (ground witherite)	18,169	17,321	$14,134	4,739	61,284
Manufactured (chemically precipitated)		1,554		2,666	37,462
Barium binoxide	6,590				64,447
Barium chloride	608			19,846	151,778
Blanc fixe, or barium sulphate (chemically precipitated)	17,810	3,333		90	8,485
	450,979	53,150	14,134	150,049	589,713

Product	1921	1922	1923	1924	1925	
					Short tons	Value
Manufactured barite	$16,942	$59,453	$88,741	$38,292	3,203	$40,008
Lithopone	432,019	885,671	776,383	543,025	6,330	478,395
Barium carbonate:						
Natural (ground witherite)	25,188	39,114	41,823	56,415	2,390	63,634
Manufactured (chemically precipitated)	80,603	210,250	79,482	128,217	7,188	160,164
Barium binoxide	127,631	189,334	152,270	120,374	635	70,553
Barium chloride	72,621	112,785	75,014	100,810	2,167	67,306
Blanc fixe, or barium sulphate (chemically precipitated)	22,470	76,445	32,063	50,465	1,996	81,439
Barium hydroxide	(1)	[1] 6,573	16,872	8,241	120	5,605
Barium nitrate	(1)	[1] 16,795	59,766	54,638	703	58,192
	777,474	1,596,420	1,322,414	1,100,477	24,732	1,025,296

[1] Not separately classified prior to Sept. 22, 1922.

Prior to 1922 barium products had not been exported in appreciable quantity, and no separate record of the exports was kept. Exports of lithopone have been as follows: 1922, 1,616 short tons, valued at $169,982; 1923, 1,485 tons, $176,624; 1924, 923 tons, $104,783; 1925, 1,287 tons, $132,771.

BAUXITE AND ALUMINUM

BAUXITE

Bauxite produced in the United States, 1916–1925

Year	Georgia, Alabama, and Tennessee		Arkansas		Total	
	Long tons	Value	Long tons	Value	Long tons	Value
1916	49,190	$284,810	375,910	$2,011,590	425,100	$2,296,400
1917	62,134	395,051	506,556	2,724,007	568,690	3,119,058
1918	42,829	314,112	562,892	3,133,880	605,721	3,447,992
1919	43,076	346,588	333,490	1,855,159	376,566	2,201,747
1920	40,029	349,453	481,279	2,897,892	521,308	3,247,345
1921	14,700	134,400	124,850	755,400	139,550	889,800
1922	42,810	329,440	266,790	1,682,890	309,600	2,012,330
1923	28,810	176,030	493,880	2,980,580	522,690	3,156,610
1924	19,940	156,990	327,630	1,981,000	347,570	2,137,990
1925	20,220	109,800	296,320	1,878,450	316,540	1,988,250

Bauxite imported into and exported from the United States, 1916–1925

Year	Imports for consumption		Exports (including bauxite concentrates)	
	Long tons	Value	Long tons	Value
1916	30	$87	17,939	$987,454
1917	7,691	28,989	21,791	1,323,926
1918	3,653	14,791	19,711	1,523,688
1919	6,082	36,820	17,701	1,372,094
1920	42,895	251,284	22,257	1,843,596
1921	27,587	164,589	5,942	488,785
1922	23,656	93,805	19,617	961,208
1923	119,020	593,882	78,560	3,380,486
1924	201,974	909,493	77,065	3,979,832
1925	353,696	1,549,120	78,633	4,134,455

ALUMINUM

Value of aluminum produced in the United States, 1916–1925

Year	Primary metal	Secondary metal [1]	Year	Primary metal	Secondary metal [1]
1916	$33,900,000	$23,430,200	1921	$10,906,000	$3,775,400
1917	45,882,000	16,711,800	1922	13,622,000	6,085,900
1918	41,159,000	10,113,600	1923	28,305,000	10,824,600
1919	38,558,000	12,014,600	1924	37,607,000	14,596,200
1920	41,375,000	9,489,100	1925	36,430,000	24,816,000

[1] Value of secondary aluminum based on average price at New York, as given by American Metal Market.

Aluminum imported for consumption in the United States, 1916–1925

Year	Crude and semicrude [1]		Manufactures of [2]	Total value
	Pounds	Value		
1916	6,698,615	$1,752,918	$32,952	$1,785,870
1917	89,291	35,386	21,504	56,890
1918	1,690,683	533,704	20,882	554,586
1919	13,852,065	4,530,579	38,016	4,568,595
1920	39,298,649	12,183,891	893,131	13,077,022
1921	32,559,017	7,627,508	1,262,283	8,889,791
1922	43,891,933	8,286,819	1,408,193	9,695,012
1923	42,476,789	8,316,816	425,747	8,742,563
1924	31,809,941	6,859,785	285,251	7,145,036
1925	41,997,178	9,805,645	301,122	10,106,767

[1] Includes crude aluminum, plates, sheets, wire, etc.
[2] Includes aluminum leaf, kitchen utensils, and all other manufactures of aluminum.

Aluminum and manufactures of aluminum exported from the United States, 1916–1925

Year		Crude and semicrude [1]		Manufactures of	Total value
		Pounds	Value		
1916		(2)	(2)	(2)	$15,417,134
1917	Jan.–June	(2)	(2)	(2)	9,029,458
	July–Dec.	10,020,404	$4,571,193	$985,816	5,557,009
1918		24,135,234	8,979,315	1,890,073	10,869,388
1919		5,020,352	1,744,896	2,145,430	3,890,326
1920		9,407,631	3,067,617	2,563,164	5,630,781
1921		2,196,378	801,075	2,307,782	3,108,857
1922		4,347,020	1,127,460	[3] 1,708,656	2,836,116
1923		5,539,671	1,517,562	[3] 2,053,977	3,571,539
1924		6,343,512	1,632,315	[3] 2,540,075	4,172,390
1925		12,642,034	3,365,815	[3] 2,691,256	6,057,071

[1] Includes ingots, metal and alloys, plates and sheets, etc.
[2] Not separately recorded prior to July, 1917.
[3] Represents value of 4,544,949 pounds in 1922, 5,402,034 pounds in 1923, 6,783,240 pounds in 1924, and 6,463,192 pounds in 1925 of tubes, moldings, castings, and other shapes, table, kitchen, or hospital utensils, and other manufactures. Figures of quantity not available prior to 1922.

BISMUTH

The bismuth produced in the United States is a by-product obtained in the refining of lead and tin bullion, part of which is from ores of foreign origin. Figures of production are not available for publication.

Bismuth imported for consumption in the United States, 1916–1925

Year	Pounds	Value	Year	Pounds	Value
1916	76,723	$195,975	1921	94,085	$114,891
1917	69,250	142,300	1922 [1]	121,505	239,777
1918	135,700	277,273	1923 [1]	62,640	146,178
1919	57,607	55,179	1924 [1]	18,494	39,653
1920	72,771	161,877	1925 [1]	99,694	187,340

[1] Also 9,392 pounds of "compounds, mixtures, and salts of bismuth," valued at $8,681, imported Sept. 22 to Dec. 31, 1922. Not separately classified prior to new tariff. Similar additional imports in 1923 were 11,731 pounds, valued at $13,717; in 1924, 10,066 pounds, $12,533; and in 1925, 16,983 pounds, $18,958.

Exports of bismuth are not separately recorded.

BORAX

[See Sodium salts (natural)]

BRIQUETS (FUEL)

Fuel briquets produced in the United States, 1916–1925

Year	Short tons	Value	Year	Short tons	Value
1916	295, 155	$1, 445, 662	1921	398, 949	$3, 632, 301
1917	406, 856	2, 233, 888	1922	619, 425	5, 444, 926
1918	477, 235	3, 212, 793	1923	696, 810	5, 898, 698
1919	295, 734	2, 301, 054	1924	580, 470	4, 986, 622
1920	567, 192	4, 623, 831	1925	839, 370	7, 128, 404

BROMINE

Bromine sold by producers in the United States, 1916–1925

Year	Pounds	Value	Year	Pounds	Value
1916	728, 520	$951, 932	1921	711, 953	$172, 759
1917	895, 499	492, 703	1922	1, 005, 174	150, 668
1918	1, 727, 156	970, 099	1923	842, 352	146, 176
1919	1, 854, 971	1, 234, 969	1924	2, 033, 804	594, 685
1920	1, 160, 584	745, 381	1925	1, 566, 120	488, 406

Imports of bromine have been as follows: 1925, 8,009 pounds, $2,110; 1924, 37,318 pounds, $8,958; 1923, 782 pounds, $1,171; 1922, 1,094 pounds, $339; 1921, 300 pounds, $84. No imports were recorded for 1916 to 1920.

Exports are not specifically shown.

CADMIUM

Metallic cadmium and cadmium sulphide produced in the United States, 1916–1925

Year	Metallic cadmium		Cadmium sulphide	
	Pounds	Value	Pounds	Value
1916	135, 212	$210, 931	22, 176	$27, 942
1917	207, 408	305, 097	50, 169	70, 939
1918	127, 164	188, 203	51, 702	70, 315
1919	99, 939	121, 926	31, 197	37, 436
1920	129, 283	151, 261	32, 133	37, 274
1921	68, 501	67, 131	65, 446	71, 336
1922	131, 590	143, 433	134, 774	152, 295
1923	183, 816	161, 758	(1)	(1)
1924	129, 328	77, 597	(1)	(1)
1925	502, 824	276, 553	(1)	(1)

[1] Bureau of Mines not at liberty to publish figures.

Imports of cadmium for consumption have been as follows: 1925, 5 pounds, valued at $6; 1924, 1,102 pounds, $743; 1923, 16 pounds, $119; 1922, 2,240 pounds, $2,434; 1921, 101 pounds, $216; 1916–1920, none.

Exports of cadmium are not separately recorded by the Bureau of Foreign and Domestic Commerce, and hence are not regularly available, but it is known that domestic cadmium was largely exported during the World War. Special canvasses showed that about 40,000 pounds of cadmium was exported in 1918, of which the larger part went to France.

CALCIUM CHLORIDE

Calcium-magnesium chloride, from natural brines, sold by producers in the United States, 1916–1925

Year	Short tons	Value	Year	Short tons	Value
1916	27,709	$224,997	1921	23,672	$510,723
1917	30,503	451,480	1922	33,067	571,326
1918	26,624	503,452	1923	44,961	663,384
1919	26,123	321,596	1924	58,791	1,164,848
1920	27,849	539,471	1925	67,870	1,386,639

Imports of calcium chloride have been as follows: 1925, 2,253 short tons, valued at $37,121; 1924, 3,996 tons, $54,542; 1923, 3,232 tons, $48,527. From September 22 to December 31, 1922, 740 tons, valued at $8,563, was imported. Similar imports were not separately recorded prior to new tariff.

Exports of calcium chloride are not separately shown.

CARBON BLACK

Carbon black produced from natural gas in the United States, 1919–1925 [1]

Year	Number of producers reporting	Carbon black produced		Natural gas used (estimate)
		Pounds	Value at plant	M cubic feet
1919	17	52,056,941	$3,816,040	49,896,000
1920	19	51,321,892	4,032,286	40,599,000
1921	23	59,766,315	5,445,878	50,565,000
1922	26	67,795,129	5,819,618	53,629,000
1923	47	138,262,648	11,692,066	109,096,000
1924	46	186,872,034	11,564,936	156,514,000
1925	42	177,417,378	9,639,585	140,366,000

[1] Figures not available prior to 1919.

Imports of carbon black are not separately recorded. Exports were not separately recorded until 1925 when they were 43,182,635 pounds, valued at $3,555,769.

CEMENT

Hydraulic cements shipped from mills in the United States, 1916–1925

Year	Masonry, natural, and puzzolan cements		Portland cement		Total	
	Barrels	Value	Barrels	Value	Barrels	Value
1916	842,137	$430,874	94,552,296	$104,258,216	95,394,433	$104,689,090
1917	639,456	435,370	90,703,474	122,775,088	91,342,930	123,210,458
1918	432,966	401,341	70,915,508	113,316,275	71,348,474	113,717,616
1919	528,589	583,554	85,612,899	146,734,844	86,141,488	147,318,398
1920	767,481	1,150,890	96,311,719	194,439,025	97,079,200	195,589,915
1921	539,402	897,025	95,507,147	180,778,415	96,046,549	181,675,440
1922	889,428	1,293,598	117,701,216	207,170,430	118,590,644	208,464,028
1923	1,271,674	1,947,352	135,912,118	257,684,424	137,183,792	259,631,776
1924	1,418,461	2,006,559	146,047,549	264,046,708	147,466,010	266,053,267
1925	1,751,725	2,551,583	157,295,212	278,524,108	159,046,937	281,075,691

Portland cement produced in the United States, 1916–1925, in barrels

1916	91,521,198	1921	98,842,049
1917	92,814,202	1922	114,789,984
1918	71,081,663	1923	137,969,238
1919	80,777,935	1924	149,358,109
1920	100,023,245	1925	161,658,901

Portland cement produced, shipped, and in stock in the United States, 1924–25, by States and districts

	Production				Shipments				Stock, Dec. 31 (barrels)	
	Active plants		Barrels		1924		1925		1924	1925
	1924	1925	1924	1925	Barrels	Value	Barrels	Value		
STATE										
Alabama	5	5	5,552,550	6,288,117	5,542,687	$9,147,367	6,045,967	$9,824,439	146,229	388,379
California	10	10	11,615,379	13,098,140	11,481,730	25,532,707	13,109,426	26,159,531	502,584	491,298
Illinois	4	4	6,994,323	7,101,024	6,955,455	12,026,310	6,749,532	11,481,576	691,334	1,042,826
Iowa	5	5	5,624,466	4,648,145	4,881,613	8,811,587	4,856,849	8,674,563	1,695,193	1,486,489
Kansas	7	7	5,894,236	6,511,393	5,809,646	9,900,547	6,513,297	10,861,506	892,413	890,509
Michigan	15	16	9,259,781	10,936,181	8,991,270	16,405,761	10,073,453	17,511,908	1,060,047	1,922,775
Missouri	5	5	7,871,621	8,331,751	7,711,206	13,515,267	8,168,165	14,155,795	921,165	1,084,751
New York	9	9	7,571,856	8,769,584	7,435,875	13,460,594	8,534,089	14,967,642	792,831	1,028,326
Ohio	7	9	4,600,835	5,714,685	4,298,027	7,836,325	5,426,768	9,600,084	656,590	944,507
Pennsylvania	22	22	40,849,602	42,346,830	40,208,860	69,693,517	41,899,787	72,870,981	2,759,021	3,206,064
Texas	5	6	4,565,983	4,858,212	4,488,143	8,322,658	4,735,521	8,729,046	356,212	478,903
Washington	4	4	1,842,113	2,481,923	1,793,403	4,236,554	2,499,237	5,523,324	289,614	272,300
Other States [1]	34	36	37,115,364	40,572,916	36,449,634	65,157,514	38,683,121	68,163,713	3,388,462	5,278,257
	132	138	149,358,109	161,658,901	146,047,549	264,046,708	157,295,212	278,524,108	14,151,695	18,515,384
COMMERCIAL DISTRICT										
Eastern Pennsylvania, New Jersey, and Maryland	22	22	38,656,739	40,279,457	37,989,250	65,500,657	40,286,898	70,094,072	2,541,627	2,534,186
New York	9	9	7,571,856	8,769,584	7,435,875	13,460,594	8,534,089	14,967,642	792,831	1,028,326
Ohio, western Pennsylvania, and West Virginia	12	14	14,331,451	15,572,602	14,028,762	25,104,849	14,628,575	25,614,083	1,369,916	2,313,943
Michigan	15	16	9,259,781	10,936,181	8,991,270	16,405,761	10,073,453	17,511,908	1,060,047	1,922,775
Wisconsin,[2] Illinois, Indiana, and Kentucky	11	11	21,823,469	23,521,488	21,343,396	37,189,604	22,052,884	37,792,110	2,041,760	3,510,364
Virginia, Tennessee, Alabama, and Georgia	12	14	11,411,054	13,505,792	11,374,280	19,201,389	13,048,251	21,581,494	491,474	949,015
Eastern Missouri, Iowa, Minnesota, and South Dakota [3]	11	11	14,822,738	14,571,751	13,984,167	24,757,538	14,477,932	25,317,292	2,737,240	2,831,059
Western Missouri, Nebraska, Kansas, and Oklahoma	11	11	9,892,813	10,672,816	9,586,984	16,262,422	10,524,247	17,772,268	1,507,824	1,656,393
Texas	5	6	4,565,983	4,858,212	4,488,143	8,322,658	4,735,521	8,729,046	356,212	478,903
Colorado and Utah	5	5	2,423,830	2,005,071	2,377,774	5,081,599	2,018,034	4,388,453	315,990	303,027
California	10	10	11,615,379	13,098,140	11,481,730	25,532,707	13,109,426	26,159,531	502,584	491,298
Oregon, Washington, and Montana	9	9	2,983,016	3,867,807	2,965,918	7,226,930	3,805,902	8,596,209	434,190	496,095
	132	138	149,358,109	161,658,901	146,047,549	264,046,708	157,295,212	278,524,108	14,151,695	18,515,384

[1] Colorado, Georgia, Indiana, Kentucky, Maryland, Minnesota, Montana, Nebraska, New Jersey, Oklahoma, Oregon, South Dakota, Tennessee, Utah, Virginia, West Virginia, and Wisconsin.
[2] Began producing and shipping in June, 1924.
[3] South Dakota began producing in December, 1924, and shipping in January, 1925.

Hydraulic cement imported into and exported from the United States, 1916-1925

Year	Imports for consumption		Exports	
	Barrels	Value	Barrels	Value
1916	1,836	$4,942	2,563,976	$3,828,231
1917	2,323	6,076	2,586,215	5,328,536
1918	305	1,200	2,252,446	5,912,166
1919	8,931	52,636	2,463,573	7,513,389
1920	524,604	1,254,729	2,985,807	10,045,369
1921	122,317	388,842	1,181,014	4,276,986
1922	355,931	692,429	1,127,845	3,206,201
1923	1,767,264	3,145,977	1,001,688	2,944,174
1924	2,023,663	3,139,788	878,543	2,615,154
1925	3,667,458	5,836,482	1,019,597	3,003,128

CHROMITE

Chromite shipped from mines in the United States, 1916–1925

Year	Long tons	Value	Year	Long tons	Value
1916	47,035	$726,243	1921	282	$2,900
1917	43,725	1,049,400	1922	355	7,288
1918	82,430	3,955,567	1923	227	3,819
1919	5,079	129,362	1924	288	1,140
1920	2,502	44,857	1925	108	2,105

Crude chromite imported for consumption in the United States, 1916–1925

Year	Long tons	Value	Year	Long tons	Value
1916	115,945	$1,548,402	1921	81,836	$654,602
1917	72,063	1,110,659	1922	90,081	741,186
1918	100,142	2,892,825	1923	129,693	1,123,120
1919	61,404	1,381,497	1924	118,343	1,095,603
1920	150,275	1,921,824	1925	149,739	1,207,420

There are no exports of chromite.

CLAY

Clay sold by producers in the United States, 1916–1925

Year	Kaolin, china clay, and paper clay		Ball clay		Slip clay		Fire clay	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1916	201,157	$1,075,730	89,761	$391,152	14,064	$47,939	2,057,814	$3,708,009
1917	206,334	1,263,799	107,406	569,240	16,972	70,505	2,347,972	5,625,095
1918	179,694	1,459,529	89,896	590,631	13,552	49,898	2,305,033	5,664,064
1919	152,828	1,475,681	65,026	520,849	5,149	17,556	1,755,331	4,628,605
1920	268,203	2,865,407	69,477	584,611	9,006	41,519	2,261,915	7,088,049
1921	162,726	1,579,163	54,014	354,565	4,608	14,841	1,195,861	3,560,373
1922	275,675	2,346,095	76,792	440,877	4,050	19,405	1,679,220	4,633,486
1923	336,803	2,926,255	97,068	620,978	8,520	43,609	2,298,163	6,565,899
1924	326,611	2,923,965	83,034	581,966	5,910	31,623	2,443,710	6,737,063
1925	367,319	3,220,719	109,607	699,427	7,349	37,397	2,566,934	7,312,349

Year	Stoneware clay		Miscellaneous clay		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1916	135,958	$137,779	433,836	$391,165	2,932,590	$5,751,774
1917	81,352	113,839	353,808	400,068	3,113,844	8,042,546
1918	86,800	147,098	301,386	421,421	2,976,361	8,332,641
1919	60,236	80,367	236,530	367,573	2,275,100	7,090,631
1920	106,350	229,221	322,100	467,856	3,037,051	11,276,663
1921	86,574	184,540	242,963	361,818	1,746,746	6,055,300
1922	86,866	164,870	525,097	725,781	2,647,700	8,330,514
1923	81,389	194,358	612,717	837,814	3,434,660	11,188,913
1924	59,194	117,142	772,660	1,116,377	3,691,119	11,507,536
1925	77,438	162,161	901,773	1,304,579	4,030,420	12,736,632

Clay imported for consumption in the United States, 1916–1925

Year	Kaolin or china clay		Common blue and Gross Almerode glass-pot clay		All other clays				Total	
					Unwrought		Wrought			
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1916	253,707	$1,326,684	2,501	$12,134	42,478	$163,421	180	$1,994	298,866	$1,504,233
1917	241,029	1,315,769	88	709	26,581	123,439	338	2,142	268,036	1,442,059
1918	168,100	1,153,240	114	983	26,984	163,484	137	1,087	195,335	1,318,794
1919	180,592	1,965,393	4	133	23,759	187,550	498	4,262	204,853	2,157,338
1920	361,800	3,568,677	6,837	157,201	34,252	272,524	691	10,267	403,580	4,008,669
1921	162,906	1,546,285	4,468	77,217	41,421	348,870	120	2,313	208,915	1,974,685
1922	310,136	2,963,420	7,323	84,415	40,624	327,388	2,566	29,398	360,649	3,404,621
1923	311,298	3,046,191	12,999	121,272	65,379	481,614	1,676	21,892	391,352	3,670,969
1924	353,124	3,188,454	7,059	62,883	82,562	706,018	1,322	18,685	444,067	3,976,040
1925	372,552	3,195,694	11,889	107,940	49,991	499,325	2,383	29,266	436,815	3,832,225

Domestic clay exported from the United States, 1916–1925

Year	Fire clay		All other		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1916	45,752	$144,552	27,941	$145,970	73,693	$290,522
1917	54,023	268,093	29,194	178,764	83,217	446,857
1918	60,206	333,880	24,348	192,053	84,554	525,933
1919	37,486	262,501	30,983	249,571	68,469	512,072
1920	54,125	393,177	66,035	775,222	120,160	1,168,399
1921	23,666	177,979	23,779	183,449	47,445	361,428
1922	24,391	169,664	[1] 23,285	[1] 267,908	47,676	437,572
1923	50,055	303,675	34,840	329,192	84,895	632,867
1924	41,704	312,676	31,051	420,040	72,755	732,716
1925	44,037	350,571	39,006	530,995	83,043	881,566

[1] Includes 2,091 short tons of "kaolin, china, and paper clay," valued at $27,840. Similar exports not shown separately for other years.

CLAY PRODUCTS

Value of the clay products of the United States, 1916–1925 [1]

Year	Brick and tile	Pottery	Total	Year	Brick and tile	Pottery	Total
1916	$152,673,593	$48,217,242	$200,890,835	1921	$186,589,507	$84,149,029	$270,738,536
1917	176,350,251	56,162,522	232,512,773	1922	[2] 229,508,106	91,986,297	[2] 321,494,403
1918	156,661,700	63,911,793	220,573,493	1923	309,631,561	114,951,067	424,582,628
1919	197,488,616	77,857,762	275,346,378	1924	297,764,393	118,014,985	415,779,378
1920	266,953,426	106,716,676	373,670,102	1925	311,428,417	112,018,500	423,446,917

[1] Canvass discontinued by U. S. Geological Survey after 1920. Figures for 1921 to 1925 obtained through cooperation with Bureau of the Census.
[2] Includes value of "prepared clay," figures for which are not separately published.

Clay products of the United States, 1924 and 1925, by products [1]

Product	1924		1925	
	Quantity	Value	Quantity	Value
Common brick ..... thousands	7,158,714	$86,691,550	7,561,501	$88,551,400
Vitrified brick or block ..... do	554,440	12,973,904	539,101	11,875,697
Face brick ..... do	2,030,403	39,931,055	2,474,690	45,427,625
Fancy or ornamental brick ..... do	538	33,419	1,701	50,279
Enameled brick ..... do	21,074	1,789,012	16,931	1,507,659
Architectural terra cotta ..... short tons	140,624	16,445,630	152,441	19,138,690
Fireproofing and hollow building tile ..... do	3,534,784	24,998,068	4,224,902	29,264,224
Tile (not drain)		24,841,813		27,123,809
Drain tile ..... short tons	592,641	4,817,390	660,673	4,960,423
Sewer pipe ..... do	1,951,612	32,399,971	2,138,672	30,420,828
Stove lining ..... do	41,986	1,036,767	25,852	656,139
Fire brick ..... thousands	955,399	40,620,941	995,079	41,163,701
Miscellaneous		11,184,873		11,287,943
Total brick and tile		297,764,393		311,428,417
Total pottery		118,014,985		112,018,500
Grand total		415,779,378		423,446,917

[1] Figures obtained through cooperation with Bureau of the Census.

Value of clay products of the United States, 1924 and 1925, by States [1]

State	1924				1925			
	Number of firms reporting	Brick and tile	Pottery	Total	Number of firms reporting	Brick and tile	Pottery	Total
Alabama	46	$4,221,024	$13,712	$4,234,736	44	$4,980,321	$7,575	$4,987,896
Arizona	5	98,564	----------	98,564	10	181,358	----------	181,358
Arkansas	17	1,356,425	(2)	[3] 1,356,425	14	1,689,611	(2)	[3] 1,689,611
California	86	17,506,122	3,488,610	20,994,732	99	18,511,530	2,813,314	21,324,844
Colorado	37	3,672,879	281,760	3,954,639	36	3,839,323	287,622	4,126,945
Connecticut	28	3,469,921	(2)	[3] 3,469,921	29	2,509,727	(2)	[3] 2,509,727
Delaware	11	235,555	----------	235,555	9	271,701	----------	271,701
District of Columbia	3	(2)	(2)	175,252	4	131,080	(2)	[3] 131,080
Florida	10	239,073	(2)	[3] 239,073	10	317,339	(2)	[3] 317,339
Georgia	41	6,008,618	24,332	6,032,950	38	6,362,365	6,862	6,369,227
Idaho	6	205,172	----------	205,172	5	184,007	----------	184,007
Illinois	140	28,298,188	5,293,180	33,591,368	136	31,340,980	5,423,000	36,763,980
Indiana	103	12,493,776	3,874,363	16,368,139	112	14,344,546	3,693,386	18,037,932
Iowa	69	5,669,810	(2)	[3] 5,669,810	65	5,703,537	(2)	[3] 5,703,537
Kansas	29	4,024,535	----------	4,024,535	32	4,345,971	(2)	[3] 4,345,971
Kentucky	44	7,316,651	202,588	7,519,239	50	7,647,922	205,433	7,853,355
Louisiana	18	324,064	(2)	[3] 324,064	20	674,167	(2)	[3] 674,167
Maine	17	707,044	----------	707,044	16	625,969	----------	625,969
Maryland	33	2,705,975	1,267,099	3,973,074	32	2,868,452	(2)	[3] 2,868,452
Massachusetts	42	2,546,926	1,312,327	3,859,253	39	2,613,560	1,175,604	3,789,164
Michigan	37	6,912,135	3,334,818	10,246,953	43	4,287,422	3,108,649	7,396,071
Minnesota	24	1,675,204	(2)	[3] 1,675,204	27	1,764,860	(2)	[3] 1,764,860
Mississippi	26	930,649	24,679	955,328	28	1,026,141	24,100	1,050,241
Missouri	64	16,242,225	95,936	16,338,161	68	17,521,866	(2)	[3] 17,521,866
Montana	9	181,057	----------	181,057	10	271,187	----------	271,187
Nebraska	21	796,725	(2)	[3] 796,725	26	964,258	(2)	[3] 964,258
Nevada	1	(2)	----------	(2)	1	(2)	----------	(2)
New Hampshire	14	868,444	----------	868,444	12	828,541	----------	828,541
New Jersey	129	20,445,851	25,968,316	46,414,167	127	21,610,853	24,399,771	46,010,624
New Mexico	3	18,611	----------	18,611	5	144,639	----------	144,639
New York	117	17,719,165	8,421,523	26,140,688	121	17,174,844	7,375,907	24,550,751
North Carolina	78	3,989,381	11,050	4,000,431	72	3,860,702	8,260	3,868,962
North Dakota	4	168,855	----------	168,855	4	149,774	----------	149,774
Ohio	384	56,216,577	41,615,064	97,831,641	393	57,602,803	40,389,018	97,991,821
Oklahoma	21	1,963,484	----------	1,963,484	18	1,813,425	----------	1,813,425
Oregon	13	701,577	(2)	[3] 701,577	20	839,286	(2)	[3] 839,286
Pennsylvania	308	43,935,463	8,231,903	52,167,366	313	46,424,975	7,944,427	54,369,402
Rhode Island	1	(2)	----------	(2)	1	(2)	----------	(2)
South Carolina	26	1,477,784	33,370	1,511,154	26	1,881,936	24,305	1,906,241
South Dakota	2	(2)	----------	(2)	2	(2)	----------	(2)
Tennessee	42	4,245,390	687,762	4,933,152	40	3,941,395	(2)	[3] 3,941,395
Texas	57	5,364,911	104,997	5,469,908	67	6,139,614	158,431	6,298,045
Utah	14	1,047,199	(2)	[3] 1,047,199	14	1,017,752	(2)	[3] 1,017,752
Vermont	2	(2)	----------	(2)	3	98,564	----------	98,564
Virginia	52	3,866,761	421,879	4,288,640	51	3,909,634	(2)	[3] 3,909,634
Washington	29	2,583,707	23,690	2,607,397	33	2,597,207	22,043	2,619,250
West Virginia	44	3,571,288	12,053,734	15,625,022	50	4,721,645	10,571,726	15,293,371
Wisconsin	40	1,063,164	(2)	[3] 1,063,164	37	1,180,496	(2)	[3] 1,180,496
Wyoming	6	126,606	----------	126,606	5	99,771	----------	99,771
Undistributed	------	551,858	1,228,293	1,604,899	------	411,361	4,379,067	4,790,428
	2,353	297,764,393	118,014,985	415,779,378	2,417	311,428,417	112,018,500	423,446,917

[1] Figures obtained through cooperation with Bureau of the Census.
[2] Included under "Undistributed."
[3] Exclusive of pottery, value for which is included under "Undistributed."

Value of clay products imported for consumption in the United States, 1916–1925

Year	Pottery								Brick, fire brick, tile, and miscellaneous clay products	Grand total
	Brown earthen and common stone ware [1]	Tobacco pipes and pipe bowls of clay	Earthenware and crockery composed of a nonvitrified absorbent body		China and porcelain		Sanitary earthenware decorated and not decorated	Total		
			Not decorated	Decorated	Not decorated	Decorated				
1916	$264,715	$10,378	$173,192	$1,669,712	$289,219	$3,177,998	$15,371	$5,600,585	$165,080	$5,765,665
1917	518,965	8,209	235,104	1,960,150	157,658	3,409,527	43,701	6,333,314	309,259	6,642,573
1918	436,207	4,716	317,501	2,147,486	200,328	3,269,008	18,334	6,393,580	290,620	6,684,200
1919	293,120	15,852	350,644	2,476,210	359,560	3,726,695	7,980	7,230,061	196,839	7,426,900
1920	390,962	12,091	340,676	3,805,955	431,636	5,856,384	13,068	10,850,772	252,656	11,103,428
1921	288,893	11,535	405,370	3,871,554	646,427	6,918,179	12,067	12,154,025	228,804	12,382,829
1922	341,997	15,638	339,066	4,427,001	641,261	6,298,440	17,295	12,080,698	375,764	12,456,462
1923	263,388	26,606	881,480	4,916,906	864,239	8,830,266	346,589	16,129,474	864,124	16,993,598
1924	314,721	14,517	765,070	5,041,570	799,772	9,504,905	125,100	16,565,655	690,639	17,256,294
1925	401,421	22,385	544,124	5,679,094	699,792	9,994,062	5,463	17,346,341	935,507	18,281,848

[1] Including Rockingham ware and miscellaneous pottery products.

Value of clay products of domestic manufacture exported from the United States, 1916–1925

Year	Building brick	Fire brick	Tile (except drain)	Earthen and stone ware	China	Sanitary earthenware	All other	Total
1916	$189,668	$2,406,184	$403,184	$600,377	$262,119	$214,076	$779,922	$4,855,530
1917	196,207	4,011,546	450,422	805,784	422,641	323,558	743,105	6,953,263
1918	117,263	5,001,057	582,051	783,577	318,448	377,527	752,651	7,932,574
1919	248,690	2,747,512	628,836	1,148,051	523,861	563,734	721,600	6,582,284
1920	382,814	4,200,266	1,025,083	1,241,938	816,817	778,714	951,991	9,397,623
1921	415,402	2,314,911	814,456	1,014,329	312,161	535,506	873,182	6,279,947
1922	210,215	1,581,679	390,408	981,082	316,973	561,536	[1] 1,599,949	5,641,842
1923	282,454	2,332,536	373,866	932,779	334,146	657,859	[1] 1,915,842	6,829,482
1924	222,033	1,463,412	400,452	753,652	259,098	745,746	[1] 1,863,324	5,707,717
1925	194,153	1,323,128	396,088	758,883	255,578	788,528	[1] 1,041,484	4,757,842

[1] Includes electric porcelain valued at $1,379,750 in 1922, $1,783,614 in 1923, $1,767,323 in 1924, and $949,785 in 1925; not separately classified prior to 1922.

COAL

Coal produced in the United States, 1916–1925

Year	Pennsylvania anthracite		Bituminous		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1916	87,578,493	$202,009,561	502,519,682	$665,116,077	590,098,175	$867,125,638
1917	99,611,811	283,650,723	551,790,563	1,249,272,837	651,402,374	1,532,923,560
1918	98,826,084	336,480,347	579,385,820	1,491,809,940	678,211,904	1,828,290,287
1919	88,092,201	364,926,950	465,860,058	1,160,616,013	553,952,259	1,525,542,963
1920	89,598,249	434,252,198	568,666,683	2,129,933,000	658,264,932	2,564,185,000
1921	90,473,451	452,304,903	415,921,950	1,199,983,600	506,395,401	1,652,288,600
1922	54,683,022	273,700,125	422,268,099	1,274,820,000	476,951,121	1,548,520,000
1923	93,339,009	506,786,768	564,564,662	1,514,621,000	657,903,671	2,021,408,000
1924	87,926,862	477,230,852	483,686,538	1,062,626,000	571,613,400	1,539,857,000
1925	61,817,149	327,664,512	520,052,741	1,060,402,000	581,869,890	1,388,067,000

Coal produced in the United States, 1924 and 1925, by States

[Exclusive of product of wagon mines]

State	1924		1925	
	Short tons	Value	Short tons	Value
Alabama	19,130,184	$44,756,000	20,004,395	$42,442,000
Alaska	99,663	560,000	82,868	405,000
Arkansas	1,451,503	5,898,000	1,220,039	4,829,000
California, Idaho, Nebraska,[1] and Oregon	16,953	71,000	12,625	60,000
Colorado	10,444,098	31,863,000	10,310,551	30,322,000
Georgia	74,947	271,000	66,174	220,000
Illinois	68,323,281	155,260,000	66,909,359	146,492,000
Indiana	21,480,213	46,453,000	21,224,966	42,884,000
Iowa	5,468,450	18,097,000	4,714,843	14,807,000
Kansas	4,247,733	12,854,000	4,524,251	13,013,000
Kentucky	45,147,204	84,733,000	55,068,670	94,825,000
Maryland	2,133,703	4,629,000	2,694,572	5,312,000
Michigan	831,020	3,602,000	808,233	3,391,000
Missouri	2,480,880	8,154,000	2,694,215	8,281,000
Montana	2,905,365	8,596,000	3,043,686	7,879,000
New Mexico	2,786,063	9,774,000	2,556,851	8,611,000
North Carolina	57,094	224,000	65,153	283,000
North Dakota	1,200,527	2,473,000	1,324,620	2,445,000
Ohio	30,473,007	62,011,000	28,034,112	54,057,000
Oklahoma	2,329,615	8,590,000	2,325,840	7,667,000
Pennsylvania (bituminous)	130,633,773	295,164,000	136,928,019	287,899,000
South Dakota	12,043	36,000	14,447	42,000
Tennessee	4,556,555	9,711,000	5,454,011	10,077,000
Texas	1,147,011	1,721,000	1,008,375	1,566,000
Utah	4,488,157	12,057,000	4,690,342	11,991,000
Virginia	10,693,464	21,823,000	12,799,443	23,496,000
Washington	2,653,667	9,689,000	2,537,890	9,176,000
West Virginia	101,662,897	185,229,000	122,380,959	209,655,000
Wyoming	6,757,468	18,327,000	6,553,232	18,275,000
Total bituminous	483,686,538	1,062,626,000	520,052,741	1,060,402,000
Pennsylvania anthracite	87,926,862	477,230,852	61,817,149	327,664,512
Grand total	571,613,400	1,539,857,000	581,869,890	1,388,067,000

[1] Production reported from Nebraska for 1924 only.

Coal produced in the United States, 1924 and 1925, by months, in short tons

Month	Pennsylvania anthracite		Bituminous	
	1924	1925	1924	1925
January	7,724,000	7,234,000	52,507,000	51,640,000
February	7,428,000	7,003,000	47,302,000	38,770,000
March	7,908,000	6,886,000	41,288,000	37,416,000
April	6,639,000	7,292,000	30,429,000	33,514,000
May	7,549,000	7,938,000	32,276,000	35,276,000
June	7,509,000	7,616,000	31,458,000	36,960,000
July	7,584,000	8,334,000	33,346,000	39,362,000
August	6,906,000	9,014,000	35,923,000	44,633,000
September	7,408,000	52,000	42,376,000	46,556,000
October	7,479,000	69,000	48,414,000	52,907,000
November	6,604,000	153,000	42,102,000	50,497,000
December	7,189,000	226,000	46,266,000	52,522,000
	87,927,000	61,817,000	483,687,000	520,053,000

Coal imported for consumption in the United States, 1916–1925

Year	Anthracite		Bituminous		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1916	6,376	$19,316	1,713,837	$4,714,433	1,720,213	$4,733,749
1917	12,530	46,523	1,448,453	4,795,110	1,460,983	4,841,633
1918	37,272	204,385	1,457,073	6,694,081	1,494,345	6,898,466
1919	82,818	522,419	1,011,550	4,950,686	1,094,368	5,473,105
1920	31,748	257,835	1,244,990	6,733,676	1,276,738	6,991,511
1921	8,894	93,103	1,257,589	7,363,945	1,266,483	7,457,048
1922	233,528	1,502,192	5,059,999	26,747,374	5,293,527	28,249,566
1923	300,360	2,114,080	1,881,465	10,128,516	2,181,825	12,242,596
1924	117,914	880,364	416,736	2,135,402	534,650	3,015,766
1925	382,894	3,212,505	601,737	2,633,980	984,631	5,846,485

Coal exported from the United States, 1916–1925

Year	Anthracite		Bituminous[1]		Total[1]	
	Short tons	Value	Short tons	Value	Short tons	Value
1916	4,665,530	$22,470,147	21,254,627	$45,828,092	25,920,157	$68,298,239
1917	6,007,306	30,909,798	23,839,558	79,502,654	29,846,864	110,412,452
1918	4,967,808	29,215,689	22,350,730	78,664,856	27,318,538	107,880,545
1919	4,976,598	36,668,131	20,113,536	83,708,842	25,090,134	120,376,973
1920	5,403,749	45,538,100	38,517,084	304,273,241	43,920,833	349,811,341
1921	4,677,368	45,624,555	23,131,166	122,597,038	27,808,534	168,221,593
1922	2,649,457	25,350,677	12,413,085	65,891,740	15,062,542	91,242,417
1923	5,090,138	49,577,339	21,453,579	104,546,585	26,543,717	154,123,924
1924	4,017,785	40,067,804	17,100,347	70,971,302	21,118,132	111,039,106
1925	3,179,006	31,760,627	17,461,560	68,402,668	20,640,566	100,163,295

[1] Exclusive of bunker coal, which has been as follows: 1916, 8,764,819 short tons, valued at $27,491,822, 1917, 7,709,157 tons, $31,844,799; 1918, 6,196,036 tons, $29,868,023; 1919, 8,223,862 tons, $48,205,675; 1920, 10,485,639 tons, $82,461,518; 1921, 8,453,220 tons, $52,277,668; 1922, 4,614,632 tons, $27,912,957; 1923, 5,093,024 tons, $31,469,788; 1924, 4,460,412 tons, $22,883,293; 1925, 4,865,521 tons, $23,397,831.

COBALT

No cobalt ores are known to have been produced in the United States in 1916, 1917, and 1922 to 1925. Production in other years since 1916 has been as follows: 1918, 4,000 short tons of cobalt ores, mined in Idaho, were reduced to 55 tons of concentrates carrying 17.74 per cent of cobalt (19,514 pounds); 1919, concentrates carrying approximately 18 per cent of cobalt were produced in Idaho, and cobalt oxide mined and reduced near Fredericktown, Mo., contained 28 pounds of cobalt, valued at $122,452; 1920, 102,410 pounds of cobalt in oxide and hydrate, valued at $262,801, was recovered from ore mined near Fredericktown, Mo.; 1921, 42,086 pounds of heterogenite (cobalt oxide), containing 4,018 pounds of cobalt, was mined near Goodsprings, Nev.; it was shipped in 1922 and sold for $1,419.

Cobalt ore, cobalt, and oxide imported for consumption in the United States, 1916–1925

Year	Ore		Cobalt		Oxide		Total	
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
1916	[1]	[1]	136,770	$175,236	206,639	$192,009	343,409	$367,245
1917	[1]	[1]	223,794	369,950	276,406	275,821	500,200	645,771
1918	[1]	[1]	504,391	628,099	208,596	291,699	712,987	919,798
1919	17,045	$2,832	60,511	141,450	131,424	184,751	208,980	329,033
1920	13,039	4,794	143,603	326,864	202,724	399,605	[2] 359,586	[2] 731,277
1921	7,657	3,235	38,442	105,539	164,003	342,426	210,102	451,200
1922	5,195	7,075	126,364	321,396	217,530	435,895	[3] 349,089	[3] 764,366
1923	58,719	56,326	225,639	552,434	258,574	511,903	[3] 542,932	[3] 1,120,663
1924	28,786	37,276	118,952	264,935	226,703	440,898	[3] 374,441	[3] 743,109
1925	34,782	31,320	198,669	422,185	287,265	546,292	[3] 520,716	[3] 999,797

[1] Ore included with cobalt; not separately recorded until July, 1918. From July to December, 1918, imports are recorded as follows: Ore, 220,115 pounds, valued at $55,188; metal, 250,920 pounds, $498,316.

[2] Includes 220 pounds of zaffer, valued at $14. Imports of zaffer not separately recorded 1916 to 1918, and none imported 1919 and 1921 to 1925.

[3] Also 11 pounds of "other salts and compounds," valued at $26, imported Sept. 22 to Dec. 31, 1922. Not separately classified prior to new tariff. Similar additional imports in 1923 were 45,644 pounds, valued at $27,356; in 1924, 797 pounds, $856; and in 1925, 13,256 pounds, $7,894.

COKE AND COKE-OVEN BY-PRODUCTS

COKE

Coke produced in the United States, 1916–1925

Year	Beehive		By-product		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1916	35,464,224	$95,468,127	19,069,361	$75,373,070	54,533,585	$170,841,197
1917	33,167,548	159,599,864	22,439,280	138,643,153	55,606,828	298,243,017
1918	30,480,792	189,305,583	25,997,580	193,018,785	56,478,372	382,324,368
1919	19,042,936	98,094,972	25,137,621	160,244,768	44,180,557	258,339,740
1920	20,511,092	162,952,483	30,833,951	313,028,732	51,345,043	475,981,215
1921	5,538,042	30,166,449	19,749,580	117,506,646	25,287,622	147,673,095
1922	8,573,467	50,036,556	28,550,545	188,276,767	37,124,012	238,313,323
1923	19,379,870	115,905,580	37,597,664	257,591,318	56,977,534	373,496,898
1924	10,286,037	48,351,552	33,983,568	195,690,009	44,269,605	244,041,561
1925	11,354,784	51,731,566	39,912,159	210,827,571	51,266,943	262,559,137

Coke produced in the United States, 1924 and 1925, by States

State	1924		1925	
	Short tons	Value [1]	Short tons	Value [1]
Alabama	4,541,058	$17,404,066	4,670,481	$16,801,841
Colorado	735,520	(2)	644,481	(2).
Georgia	8,081	71,355	4,925	38,464
Illinois	2,355,474	20,187,519	3,011,497	22,568,845
Indiana	4,272,435	30,394,497	5,141,940	36,635,104
Kentucky	(3)	(3)	(3)	(3)
Maryland	810,118	(2)	1,019,209	(2)
Massachusetts	397,640	(2)	535,302	(2)
Michigan	1,770,547	11,914,028	1,751,118	11,708,519
Minnesota	514,764	4,903,891	518,355	4,992,024
Missouri	(3)	(3)	(3)	(3)
New Jersey	869,120	(2)	903,997	(2)
New Mexico	83,070	(2)	(3)	(3)
New York	1,600,669	11,108,944	2,219,409	12,968,066
Ohio	5,832,699	(2)	7,261,187	(2)
Pennsylvania	16,927,437	72,568,096	19,427,603	76,394,478
Rhode Island	(3)	(3)	(3)	(3)
Tennessee	207,475	1,012,064	216,488	1,161,100
Utah	257,094	(2)	314,159	(2)
Virginia	485,064	2,343,081	421,691	1,901,623
Washington	71,615	573,644	79,257	617,265
West Virginia	1,328,569	6,048,638	1,546,032	6,648,745
Wisconsin	(3)	(3)	(3)	(3)
Combined States	1,201,156	9,843,475	1,579,812	11,560,031
Undistributed		55,668,263		58,563,032
	44,269,605	244,041,561	51,266,943	262,559,137

[1] Includes operators' statements of value for that portion of product not sold (such as coke consumed by producer in associated iron furnaces).
[2] Included under "Undistributed."
[3] Included under "Combined States."

Coke produced in the United States, 1924 and 1925, by States and kinds

State	Beehive				By-product			
	1924		1925		1924		1925	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Alabama	154,686	$840,843	88,328	$453,870	4,386,372	$16,563,223	4,582,153	$16,347,971
Colorado	212,115	(1)	154,824	(1)	523,405	(1)	489,657	(1)
Georgia	8,081	71,355	4,925	38,464				
Illinois					2,355,474	20,187,519	3,011,997	22,568,845
Indiana					4,272,435	30,394,497	5,141,940	36,635,104
Kentucky	79,248	(1)	(2)	(2)	(2)	(2)	(2)	(2)
Maryland					810,118	(1)	1,019,209	(1)
Massachusetts					397,640	(1)	535,302	(1)
Michigan					1,770,547	11,914,028	1,751,118	11,708,519
Minnesota					514,764	4,903,891	518,355	4,992,024
Missouri					(2)	(2)	(2)	(2)
New Jersey					869,120	(1)	903,997	(1)
New Mexico	83,070	(1)	(2)	(2)				
New York					1,600,669	11,108,944	2,219,409	12,968,066
Ohio	109,625	(1)	156,058	(1)	5,723,074	31,008,209	7,105,129	34,190,691
Pennsylvania	8,501,282	37,893,584	9,574,341	41,875,615	8,426,155	34,674,512	9,853,262	34,518,863
Rhode Island					(2)	(2)	(2)	(2)
Tennessee	131,755	635,736	127,609	690,041	75,720	376,328	88,879	471,059
Utah	159,744	1,310,929	146,009	1,240,256	97,350	(1)	168,150	(1)
Virginia	485,064	2,343,081	421,691	1,901,623				
Washington	31,712	289,934	38,500	327,483	39,903	283,710	40,757	289,782
West Virginia	329,655	1,646,452	490,040	2,168,879	998,914	4,402,186	1,055,992	4,479,866
Wisconsin					(2)	(2)	(2)	(2)
Combined States			152,459	1,004,359	1,121,908	9,387,943	1,427,353	10,555,681
Undistributed		3,319,638		2,030,985		20,485,019		21,101,100
	10,286,037	48,351,552	11,354,784	51,731,566	33,983,568	195,690,009	39,912,159	210,827,571

[1] Included under "Undistributed." [2] Included under "Combined States."

Coke produced in the United States, 1924 and 1925, by months, in short tons

Month	1924			1925		
	Beehive	By-product	Total	Beehive	By-product	Total
January	1,228,000	3,093,000	4,321,000	1,241,000	3,404,000	4,645,000
February	1,288,000	2,980,000	4,268,000	1,117,000	3,118,000	4,235,000
March	1,429,000	3,220,000	4,649,000	1,066,000	3,449,000	4,515,000
April	1,148,000	3,009,000	4,157,000	851,000	3,308,000	4,162,000
May	810,000	2,807,000	3,617,000	710,000	3,280,000	3,990,000
June	590,000	2,425,000	3,015,000	632,000	3,151,000	3,783,000
July	476,000	2,369,000	2,845,000	561,000	3,167,000	3,728,000
August	462,000	2,445,000	2,907,000	641,000	3,159,000	3,800,000
September	556,000	2,545,000	3,101,000	794,000	3,178,000	3,972,000
October	671,000	2,899,000	3,570,000	1,068,000	3,395,000	4,463,000
November	670,000	2,926,000	3,596,000	1,286,000	3,550,000	4,836,000
December	958,000	3,266,000	4,224,000	1,385,000	3,753,000	5,138,000
	10,286,000	33,984,000	44,270,000	11,355,000	39,912,000	51,267,000

Coke imported into and exported from the United States, 1916–1925

Year	Imports for consumption		Exports	
	Short tons	Value	Short tons	Value
1916	54,955	$249,514	1,174,645	$4,202,236
1917	24,872	146,451	1,409,320	8,543,746
1918	30,168	221,880	1,687,824	11,861,408
1919	16,486	140,653	716,956	5,128,119
1920	41,143	403,175	919,892	9,993,665
1921	30,990	336,394	306,755	2,760,939
1922	94,228	802,987	511,541	4,319,538
1923	85,002	862,596	1,237,342	11,889,897
1924	82,833	795,477	659,350	4,926,478
1925	201,579	1,609,474	953,812	6,871,962

COKE-OVEN BY-PRODUCTS

By-products from coke-oven operations in the United States, 1924 and 1925

Product	Produced	Sold	
		Quantity	Value
1924			
Tar, gallons	422,074,326	209,979,999	$9,623,520
Ammonia:			
Sulphate, pounds	893,127,071	931,329,570	22,522,248
Ammonia liquor (NH_3 content)[1], do	49,029,524	47,665,811	4,656,428
Sulphate equivalent of all forms, do	(1,089,245,167)	(1,121,992,814)	27,178,676
Gas:			
Distributed through city mains, M cu. ft	[2] 541,101,050	65,676,867	23,486,416
Used in steel or affiliated plant, do		187,171,883	21,007,607
Used under boilers, etc., do		29,794,046	1,729,013
Sold for industrial use, do		18,561,057	3,561,911
			49,784,947
Light oil and derivatives:			
Crude light oil, gallons	[3] 128,956,955	7,840,582	652,467
Benzol: crude, do	3,856,908	3,880,408	831,419
Benzol: refined, do	14,278,117	13,880,200	2,905,237
Motor benzol, do	73,768,811	72,921,224	11,066,652
Toluol: crude, do	234,244	245,079	51,041
Toluol: refined, do	2,951,187	2,986,423	718,641
Solvent naphtha, do	4,474,220	3,884,585	724,874
Other light-oil products, do	1,364,528	1,077,842	78,934
			17,029,265
Naphthalene: crude, pounds	8,378,666	7,891,116	116,305
Naphthalene: refined, do	13,302	327,957	11,903
			128,208
Other products			57,891
			[4] 103,802,507

[1] Includes an unknown quantity of sulphate sold on basis of NH_3 content.
[2] Inclusive of gas wasted and gas used for heating retorts.
[3] Of the crude light oil 125,580,742 gallons was refined on the premises to make the derived products listed
[4] Exclusive of value of coke breeze.

By-products from coke-oven operations in the United States, 1924 and 1925—Continued

Product		Produced	Sold	
			Quantity	Value
1925				
Tar	gallons	480,848,814	240,160,986	$11,903,196
Ammonia:				
Sulphate	pounds	1,017,014,550	989,676,520	22,546,908
Ammonia liquor (NH_3 content)	do	65,255,767	54,809,335	4,966,885
Sulphate equivalent of all forms	do	(1,278,037,618)	(1,208,913,860)	27,513,793
Gas:				
Distributed through city mains	M cu. ft.	[2] 639,644,062	77,457,262	29,319,309
Used in steel or affiliated plant	do		230,030,325	26,380,657
Used under boilers, etc	do		25,239,072	1,451,253
Sold for industrial use	do		29,527,613	4,333,000
				61,484,219
Light oil and derivatives:				
Crude light oil	gallons	[5] 146,443,106	10,201,900	1,052,585
Benzol: crude	do	6,119,160	5,907,106	1,321,597
Benzol: refined	do	16,231,714	15,909,280	3,566,643
Motor benzol	do	81,469,925	80,957,983	13,441,422
Toluol: crude	do	127,584	46,789	10,052
Toluol: refined	do	5,329,560	4,991,358	1,300,734
Solvent naphtha	do	4,744,431	3,993,735	805,251
Other light-oil products	do	2,366,246	1,252,451	96,073
				21,594,357
Naphthalene: crude	pounds	9,238,890	9,692,185	92,369
Naphthalene: refined	do	1,018	208,332	5,124
				97,493
Other products				132,466
				[4] 122,725,524

[2] Inclusive of gas wasted and gas used for heating retorts.
[4] Exclusive of value of coke breeze.
[5] Of the crude light oil 143,296,567 gallons was refined on the premises to make the derived products listed.

COPPER [1]

Summary of statistics of the copper industry in the United States, 1923–1925

	1923	1924	1925
Production of copper:			
Smelter output (pounds)	1,434,999,962	1,634,249,192	1,674,869,886
Mine production (do)	1,477,739,709	1,606,165,018	1,678,117,747
Refinery production of new copper—			
Electrolytic (do)	1,302,454,492	1,499,223,447	1,533,995,439
Lake (do)	137,691,306	145,333,227	138,029,764
Casting and pig (do)	24,019,197	29,657,925	10,870,144
Total domestic (do)	1,464,164,995	1,674,214,599	1,682,895,347
Total domestic and foreign (do)	1,979,835,616	2,260,076,010	2,204,573,824
Total new and old copper (do)	2,802,000,000	3,037,000,000	3,045,000,000
Ore produced:			
Copper ore (short tons)	45,519,317	49,178,315	53,103,014
Average yield of copper (per cent)	1.58	1.59	1.54
Copper-lead and copper-zinc ores (short tons)	162,181	219,874	228,612
Average price per pound (cents)	14.7	13.1	14.2
General imports (unmanufactured) (pounds)	676,473,338	768,813,731	652,971,407
Exports of metallic copper [2] (do)	828,854,827	1,116,775,136	1,082,369,439
Withdrawn from total supply on domestic account:			
Total new copper (pounds)	1,300,473,331	1,354,742,564	1,401,012,091
Total new and old copper (do)	2,122,000,000	2,131,000,000	2,241,000,000
Stocks at end of year:			
Refined copper (do)	264,000,000	243,000,000	124,000,000
Blister and material in solution (do)	432,000,000	393,000,000	432,000,000
World's production (do)	2,709,615,000	2,958,753,000	3,053,995,000
Value of smelter production from domestic ores	$210,945,000	$214,087,000	$237,832,000

[1] For prices of copper, see statement on p. A15.
[2] Total exports of copper, exclusive of ore, concentrates, composition metal, and a small quantity of unrefined copper for which figures are not separable from those for ore and concentrates.

Copper produced in the United States from domestic ores, 1916–1925

[Smelter output, in pounds fine]

Year	Pounds	Value	Year	Pounds	Value
1916	1,927,850,548	$474,288,000	1921	505,586,098	$65,221,000
1917	1,886,120,721	514,911,000	1922	950,285,947	128,289,000
1918	1,908,533,595	471,408,000	1923	1,434,999,962	210,945,000
1919	1,286,419,329	239,274,000	1924	1,634,249,192	214,087,000
1920	1,209,061,040	222,467,000	1925	1,674,869,886	237,832,000

Copper produced in the United States from domestic ores, 1921–1925, by States

[Smelter output, in pounds fine]

State	1921	1922	1923	1924	1925
Alaska	76,808,114	59,900,579	68,648,368	77,053,492	72,264,166
Arizona	155,165,656	428,200,634	615,493,561	672,365,115	722,653,457
California	15,906,883	20,440,430	27,042,835	49,433,716	46,943,604
Colorado	6,592,598	3,635,916	4,343,418	4,158,612	3,163,211
Georgia		8,147			
Idaho	1,971,623	3,504,944	3,664,079	3,148,519	3,144,064
Maine	3				
Michigan	100,918,001	122,545,126	137,691,306	145,333,227	138,029,764
Missouri	137,591	1,070,259	217,449	184,947	12,114
Montana	49,471,206	165,341,414	224,353,764	249,322,394	270,604,676
Nevada	15,129,116	20,398,611	63,495,928	77,281,479	77,137,563
New Mexico	18,076,909	29,127,329	57,521,171	78,145,629	76,467,245
North Carolina			61,913		
Oregon	274,934	925,954	1,182,437	716,656	126,107
Pennsylvania		888,721	1,121,573	1,263,535	562,240
South Dakota			47	4,199	2,336
Tennessee	15,084,294	14,226,232	18,721,932	18,251,996	19,789,234
Texas	587	3,889	4,216	302	785
Utah	45,831,959	79,665,563	210,118,291	256,531,349	242,730,986
Washington	598,658	369,133	839,254	978,647	1,184,807
Wyoming	9,830		87,686		331
Undistributed	3,608,136	33,066	390,734	75,378	113,196
	505,586,098	950,285,947	1,434,999,962	1,634,249,192	1,674,869,886

Primary and secondary copper produced by regular refining plants in the United States and imported, 1921–1925, in pounds

	1921	1922	1923	1924	1925
Primary:					
Domestic—[1]					
Electrolytic	506,532,984	766,944,836	1,302,454,492	1,499,223,447	1,533,995,439
Lake	100,918,001	122,545,126	137,691,306	145,333,227	138,029,764
Casting	1,740,393	15,180,723	24,019,197	29,657,925	10,870,144
Pig and best select	222,878				
	609,414,256	904,670,685	1,464,164,995	1,674,214,599	1,682,895,347
Foreign—[1]					
Electrolytic	336,088,209	345,641,677	509,873,512	577,100,034	516,632,530
Casting and best select	5,275,350	5,203,597	5,797,109	8,761,377	5,045,947
Total refinery production of new copper	950,777,815	1,255,515,959	1,979,835,616	2,260,076,010	2,204,573,824
Imports of refined copper	69,249,281	103,143,142	[2] 160,711,227	145,909,968	99,773,546
Total new refined copper made available	1,020,027,096	1,358,659,101	2,140,546,843	2,405,985,978	2,304,347,370
Secondary:					
Electrolytic	82,017,382	100,792,685	85,297,052	104,281,430	140,349,541
Casting	24,467,951	45,217,857	46,141,409	50,536,678	58,010,653
	106,485,333	146,010,542	131,438,461	154,818,108	198,360,194
	1,126,512,429	1,504,669,643	2,271,985,304	2,560,804,086	2,502,707,564

[1] The separation of refined copper into metal of domestic and foreign origin is only approximate, as an accurate separation at this stage of manufacture is not possible.

[2] Figures of imports of refined copper from Chile for 1923, as reported by the Chile Exploration Co., have been included here in place of those of the Bureau of Foreign and Domestic Commerce for Chile, which are undoubtedly very low.

In addition to their output of metallic copper the regular refining companies produced bluestone having copper content as follows: 1921, 6,646,000 pounds; 1922, 8,508,000 pounds; 1923, 7,987,000 pounds; 1924, 5,766,000 pounds; 1925, 6,754,000 pounds.

Stocks of copper in the United States, January 1, 1917–1926, in pounds

Year	Refined copper	Blister and material in process of refining	Year	Refined copper	Blister and material in process of refining
1917	128,000,000	424,000,000	1922	459,000,000	283,000,000
1918	114,000,000	411,000,000	1923	216,000,000	361,000,000
1919	189,000,000	562,600,000	1924	264,000,000	432,000,000
1920	631,000,000	273,000,000	1925	243,000,000	393,000,000
1921	659,000,000	465,000,000	1926	124,000,000	432,000,000

New refined copper withdrawn from total year's supply on domestic account in the United States, 1921–1925, in pounds

	1921	1922	1923	1924	1925
Total supply of new copper	1,020,027,096	1,358,659,101	2,140,546,843	2,405,985,978	2,304,347,370
Stocks at beginning of year	659,000,000	459,000,000	216,000,000	264,000,000	243,000,000
Total available supply	1,679,027,096	1,817,659,101	2,356,546,843	2,669,985,978	2,547,347,370
Copper exported [1]	609,038,352	705,025,268	[2] 792,073,512	[2] 1,072,243,414	[2] 1,022,335,279
Stocks at end of year	459,000,000	216,000,000	264,000,000	243,000,000	124,000,000
	1,068,038,352	921,025,268	1,056,073,512	1,315,243,414	1,146,335,279
Withdrawn on domestic account	610,988,744	896,633,833	1,300,473,331	1,354,742,564	1,401,012,091

[1] Includes unrefined black blister and converter copper (bars, pigs, and other forms) and refined in ingots, bars, rods, or other forms.

[2] Exclusive of small quantity of unrefined black blister for which figures are not separable from those for ore and concentrates.

Copper (in unmanufactured form) imported for consumption in the United States, 1916–1925

Year	Pounds	Value	Year	Pounds	Value
1916	459,607,525	$94,321,225	1921	350,582,746	$45,660,326
1917	552,789,561	134,990,680	1922	542,932,525	65,786,814
1918	569,182,467	131,064,639	1923	671,929,223	95,398,681
1919	437,570,497	88,751,115	1924	765,685,592	95,608,460
1920	480,297,985	88,782,609	1925	651,005,759	83,948,686

Copper (unmanufactured) imported into the United States, 1924 and 1925, in pounds

[General imports]

Country	Ore (copper content)	Concentrates (copper content)	Matte and regulus (copper content)	Unrefined black copper and copper in bars, pigs, or other forms	Refined in bars, plates, rods, or other forms	Old and clippings for remanufacture	Composition metal, copper chief value
1924							
Africa:							
British South				672, 560			
Portuguese—							
East	70, 378			34, 330, 735			
Other				90, 487, 936			
Australia				1, 234, 050			
Bolivia	262, 167						
Canada	27, 350, 280	1, 396, 411	35, 468	51, 121, 265	1, 109, 769	2, 328, 947	150, 161
Chile	46, 584, 230	1, 352, 352	145, 030	124, 283, 121	141, 247, 852	35, 840	
Cuba	11, 969, 920	11, 429, 580				521, 909	
France	592, 511	6, 048	13, 642	3, 376, 036	633, 645	9, 588	1, 312
Germany		37, 318	21, 159	44, 990	17, 200	59, 043	14, 862
Mexico	2, 987, 404	22, 687, 382	48, 500	69, 963, 716	477, 252	10, 317	
Peru	1, 731, 222	46, 185	13, 222	74, 951, 579		5, 946	
Spain	10, 312, 123	284, 785		16, 505, 918			
United Kingdom	155, 647	922, 254	497, 101	2, 812, 324	2, 409, 884	128, 373	21, 180
Venezuela		1, 908, 480					
Other	3, 150, 336	1, 666, 461	279, 356	1, 244, 604	14, 366	609, 107	21, 392
	105, 166, 218	41, 737, 256	1, 053, 478	471, 028, 834	145, 909, 968	3, 709, 070	208, 907
Total value	$12, 807, 225	$4, 693, 029	$125, 288	$59, 462, 150	$18, 556, 174	$402, 260	$43, 170
1925							
Africa:							
British South	65, 055	38, 950					
Portuguese—							
East	383, 444	39, 897		92, 769, 600			
Other		10, 785					
Australia	900		227, 231	224, 415			
Canada	41, 571, 234	2, 449, 488	96, 548	50, 500, 684	10, 110	5, 680, 470	10, 012
Chile	44, 554, 953	215, 560	265, 955	59, 800, 141	96, 170, 761	285, 823	
Cuba	5, 985, 806	25, 176, 103				2, 091, 015	57, 549
France	229, 939	472, 400	87, 448	100, 439			
Germany	70, 810	128, 312		1, 160	24, 640	1, 391, 205	241
Mexico	2, 220, 156	24, 771, 676	80, 000	71, 777, 809		104, 454	20, 430
Peru	593, 071	82, 582	178, 750	72, 324, 746		1, 129	
Spain	8, 897, 949			14, 419, 651			
United Kingdom	407, 187	107, 626	32, 259	3, 898, 193	22, 460	520, 741	112
Venezuela				1, 068, 971			4, 732
Other	2, 661, 832	460, 243	764, 797	12, 447, 691	3, 545, 575	353, 629	13, 873
	107, 642, 336	53, 953, 622	1, 732, 988	379, 333, 500	99, 773, 546	10, 428, 466	106, 949
Total value	$13. 582, 361	$6, 491, 514	$212, 725	$48, 870, 358	$13, 831, 407	$1, 188, 711	$12, 086

Copper exported from the United States, 1916–1925

Year	Pounds	Value	Year	Pounds	Value
1916	789, 791, 254	$206, 163, 241	1921	628, 804, 750	$85, 351, 928
1917	1, 132, 832, 663	338, 723, 756	1922	743, 039, 888	103, 874, 007
1918	747, 689, 580	195, 840, 637	1923	829, 314, 002	129, 219, 975
1919	516, 627, 775	117, 417, 055	1924	1, 116, 915, 484	156, 645, 684
1920	624, 053, 701	127, 468, 606	1925	1, 084, 208, 532	161, 165, 820

Copper exported from the United States, 1924 and 1925, in pounds

Country	Ore, concentrates, and unrefined copper (copper content)	Composition metal, copper chief value	Refined, in bars, ingots, or other forms	Old and scrap	Pipes and tubes	Plates and sheets	Wire (except insulated)	Insulated wire and cable	Rods	Other manufactures of copper
1924										
Belgium			76,954,752	64,548		67,262	234,532	70	1,043,089	334
Canada	15,467	39,247	30,946,501	2,031,679	1,109,166	1,545,578	341,949	997,006	10,296,685	1,634,683
China		199	63,128,544	51,205	629	16,740	12,961	102,455		17,998
Denmark			2,612,117			2,320	355	25,224	4,481,629	7,168
France			195,504,959	429,084		465,852	116,660	86,127	1,231,739	792,646
Germany			206,846,136	1,004,009	150	209,832	2,070		728,268	33,882
India (British)			4,501,706		10	488,654	71,214	98,013		24,560
Italy			107,989,642	253,786		918,265		8,070	103,400	66,217
Japan		406	19,055,608	185,958	15,281	111,847	9,688	73,133	4,025	11,376
Netherlands			59,221,141	166,429	8,924	243,108	105	19,104	852,308	801
Norway			1,845,311		169	88,472	2,505	21,794	1,617,310	822
Spain			5,251,322				117,000	59,362	3,000	45,917
Sweden			28,031,537		25		1,533	3,252		2,420
Switzerland			1,538,794				1,269		89,600	25,286
United Kingdom	25,453		198,656,260	793,875	1,231	1,575,307	363,473	1,022,059	39,342,119	870,088
Other Europe			3,880,901			2,420	1,448	48,481	560,268	5,269
Other countries	14,625	44,951	3,659,761	213,479	1,514,231	1,033,993	8,466,774	12,907,308	2,264,982	1,160,738
Total value	55,545	84,803	1,009,624,992	5,194,052	2,649,816	6,772,650	9,743,541	15,471,458	62,618,422	4,700,205
	$8,569	$19,971	$138,298,411	$566,163	$672,451	$1,331,537	$1,701,656	$3,895,763	$8,965,352	$1,185,811
1925										
Belgium	78,710		90,950,918	55,683		572,357	14,090	6,242	717,060	1,099
Canada	249,309		24,300,632	4,066,687	1,349,360	1,631,351	1,962,493	1,406,713	7,431,159	1,654,410
China			12,133,124	505,476	1,513	41,937	13,442	1,129,137	143	19,821
Denmark			1,630,533			1,556	3,951	17,382	2,818,405	9,315
France	224,598		145,809,549	373,539	59	448,222	2,573	189,603	785,943	5,517
Germany	1,046,118		229,291,382	4,188,651		3,935,655	90,975	57,991	1,119,902	173,106
India (British)			3,644,858	223,818	4,394	1,643,612	57,923	82,557		39,866
Italy			126,472,202	398,772		656,791	370	17,336	280,469	23,833
Japan	1,604		8,493,760	5,688	1,978	7,548	12,319	48,163		4,354
Netherlands	237,547		92,279,396	220,282	4,412	1,546,956	3,620	24,273	313,992	6,671
Norway			1,829,841		2,243		89,885	70,519	1,602,075	1,950
Spain			7,077,977	349,956		280	43,797	217,056	63,011	19,182
Sweden			29,105,773			3,200	724	9,097	280,115	13,804
Switzerland			1,688,373	57,902			500	8,703		1,931
United Kingdom			183,752,066	1,151,127	12,625	414,523	92,790	1,079,650	34,254,775	142,082
Other	1,207		9,596,053	507,880	1,416,441	1,301,295	9,276,127	13,452,571	4,602,793	1,339,938
Total value	1,839,093		968,065,437	12,105,461	2,784,025	12,205,283	11,665,579	17,816,993	54,269,842	3,456,819
	$232,636		$140,220,827	$1,555,999	$697,057	$2,331,190	$2,094,108	$4,900,264	$8,098,281	$1,035,458

CORUNDUM

[See Abrasive materials]

CRYOLITE

No natural cryolite is produced in the United States, the entire supply in this country being imported from Greenland. Artificial cryolite is produced by electrochemical processes.

Cryolite imported for consumption in the United States, 1916–1925

Year	Long tons	Value	Year	Long tons	Value
1916	3,857	$165,222	1921	3,460	$295,186
1917	4,383	218,500	1922	3,899	196,302
1918	1,950	97,500	1923	6,375	319,959
1919	2,131	106,956	1924	6,320	320,670
1920	3,864	193,638	1925	9,844	690,651

DIATOMACEOUS (INFUSORIAL) EARTH

[See Abrasive materials]

EMERY

[See Abrasive materials]

FELDSPAR

Crude feldspar sold or used by producers in the United States, 1916–1925

Year	Long tons	Value	Year	Long tons	Value
1916	118,465	$404,689	1921	91,865	$617,652
1917	126,715	474,767	1922	117,127	844,568
1918	88,498	429,989	1923	145,004	1,057,595
1919	63,441	347,992	1924	204,772	1,509,339
1920	135,551	851,123	1925	185,706	1,315,654

The foreign trade of the United States in feldspar is small and limited largely to importing from Canada. Imports have been as follows: 1925, 24,994 long tons of crude feldspar, valued at $203,524; 1924, 35,139 tons, $284,716; 1923, 24,271 tons, $184,924. Prior to September 22, 1922, imports of feldspar were not specifically classified in the official records and are therefore unknown. From that date to the end of the year the imports amounted to 7,549 long tons of crude, valued at $60,111, and 37 long tons of crushed or ground, valued at $538.

There is no record of exports of feldspar, and if any feldspar is exported the quantity is doubtless negligible.

FERRO-ALLOYS

Ferro-alloys shipped from furnaces in the United States, 1916–1925, in long tons [1]

Year	Ferro-manganese	Spiegel-eisen	Other varieties	Total	
				Quantity	Value
1916 [1]	224, 103	182, 837	182, 798	589, 738	$50, 281, 692
1917 [1]	260, 225	189, 241	184, 555	634, 021	83, 731, 724
1918 [1]	306, 076	263, 861	180, 931	750, 868	115, 433, 943
1919	198, 255	90, 855	130, 528	419, 638	53, 730, 964
1920	276, 594	103, 672	232, 542	612, 808	77, 519. 367
1921	111, 374	69, 230	68, 023	248, 627	21, 697, 785
1922	161, 612	70, 253	191, 415	423, 280	28, 259, 004
1923	226. 365	134, 086	219, 366	579, 817	49, 877, 231
1924	232, 821	76, 179	188, 244	497, 244	43, 249, 948
1925	254, 005	95, 890	266, 327	616, 222	53, 048, 100

[1] The figures for 1916 to 1918, inclusive, fall short of the actual production of the United States, as the output of certain electrically produced ferro-alloys is not available for publication.

Ferro-alloys shipped from furnaces in the United States, 1924 and 1925

Variety of alloy	1924		1925	
	Long tons	Value	Long tons	Value
Ferromanganese [1]	232, 821	$23, 533, 668	254, 005	$26, 006, 439
Spiegeleisen	76, 179	2, 354, 731	95, 890	2, 407, 226
Ferrosilicon (7 per cent or more silicon)	150, 021	7, 558, 984	221, 387	11, 405, 060
Ferromolybdenum	107	254, 970	210	236, 957
Ferrotungsten	741	1, 110, 553	1, 238	1, 991, 123
Ferrovanadium	1, 355	3, 641, 724	1, 841	4, 843, 635
Other varieties [2]	36, 020	4, 795, 318	41, 651	6, 157, 660
	497, 244	43, 249, 948	616, 222	53, 048, 100

[1] Includes small quantity of silico-manganese.
[2] 1924: Ferrochromium, ferrophosphorus, ferrotitanium, ferrozirconium, and zirconium-ferrosilicon; 1925: Ferrochromium, ferrophosphorus, ferrotitanium, ferrouranium, ferrozirconium, and zirconium-ferrosilicon.

Value of ferro-alloys imported for consumption in the United States, 1916–1925

1916	$9, 792, 747	1921	$1, 576, 131
1917	6, 703, 330	1922	7, 789, 632
1918	4, 932, 042	1923	9, 879, 433
1919	5, 384, 693	1924	5, 509, 020
1920	10, 397, 896	1925	7, 133, 618

Ferro-alloys imported for consumption in the United States, 1924 and 1925

Variety of alloy	1924		1925	
	Long tons	Value	Long tons	Value
Ferromanganese (manganese content)	45, 270	$3, 844, 474	62, 970	$6, 033, 147
Spiegeleisen	7, 433	235, 566	1, 090	39, 841
Ferrochrome and chromium:				
Ferrochrome—				
Containing 3 per cent or more carbon (chromium content)	30	5, 312	69	11, 405
Containing less than 3 per cent carbon	436	114, 879	588	129, 510
Chrome or chromium metal	2	3, 595	3	4, 769
Chromium vanadium			32	5, 065
Ferrosilicon (silicon content)	12, 125	1, 249, 071	4, 556	585, 193
Molybdenum and ferromolybdenum (molybdenum content)	(1)	802	(2)	1, 184
Titanium and ferrotitanium	13	5, 927	17	6, 698
Tungsten and ferrotungsten (tungsten content)	63	49, 394	375	316, 806
		5, 509, 020		7, 133, 618

[1] 431 pounds. [2] 274 pounds.

Ferro-alloys exported from the United States, 1916–1925

Variety of alloy	1916		1917		1918		1919		1920	
	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value
Ferromanganese	(1)	(1)	[1] 2,400	[1] $498,402	3,577	$806,087	2,999	$445,840	3,454	$642,570
Ferrosilicon	(1)	(1)	[1] 6,849	[1] 719,626	4,107	443,456	1,544	145,310	632	41,057
Tungsten and ferrotungsten	256	$1,352,631	1,038	4,122,653	550	2,545,087	17	113,276	2	5,913
Ferrovanadium	907	2,035,276	1,084	2,953,260	675	1,774,062	29	95,560	173	705,385

Variety of alloy	1921		1922		1923		1924		1925	
	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value
Ferromanganese	690	$100,474	1,107	$76,822	4,295	$151,224	3,165	$92,421	5,496	$160,568
Spiegeleisen	(2)	(2)	289	7,740						
Ferrochrome and chrome metal	(2)	(2)	23	1,941	(3)	(3)	(3)	(3)	(3)	(3)
Ferrosilicon	368	20,204	689	30,939	814	31,154	775	29,214	(3)	(3)
Tungsten and ferrotungsten			(4)	43,219	[5] 2	[5] 122,906	[5] 2	[5] 114,775	[5] 6	[5] 143,987
Ferrovanadium	98	424,886	22	69,279	23	64,713	25	81,016	46	106,754

[1] Not separately classified prior to July, 1917.
[2] Not separately classified prior to 1922.
[3] Not separately recorded.
[4] 1,009 pounds.
[5] Includes tungsten wire.

FLUORSPAR

Fluorspar shipped from mines in the United States, 1916–1925

Year	Short tons	Value	Year	Short tons	Value
1916	155,735	$922,654	1921	34,960	$724,094
1917	218,828	2,287,722	1922	141,596	2,531,165
1918	263,817	5,465,481	1923	121,188	2,505,819
1919	138,290	3,525,574	1924	124,979	2,451,131
1920	186,778	4,718,547	1925	113,669	2,052,342

Fluorspar shipped from mines in the United States, 1923–1925, by States

State	1923		1924		1925	
	Short tons	Value	Short tons	Value	Short tons	Value
Colorado	6,044	$59,710	12,301	$135,411	11,776	$153,707
Illinois	65,045	1,443,490	62,067	1,288,310	54,428	1,024,516
Kentucky	45,441	945,402	47,847	988,940	44,826	833,794
New Hampshire	142	3,160				
New Mexico	4,328	50,861	2,580	35,178	2,639	40,325
Utah	188	3,196	184	3,292		
	121,188	2,505,819	124,979	2,451,131	113,669	2,052,342

Fluorspar imported for consumption in the United States, 1916–1925

Year	Short tons	Value	Year	Short tons	Value
1916	12,323	$54,000	1921	6,229	$69,306
1917	13,616	114,598	1922	33,108	299,188
1918	12,572	169,364	1923	41,884	429,696
1919	6,943	107,631	1924	50,821	551,842
1920	24,612	265,630	1925	48,770	469,540

No exports of fluorspar have been reported by Bureau of Foreign and Domestic Commerce. Producers reported 2,764 tons, valued at $65,475, exported in 1920; 2,296 tons, $40,966, in 1922; 1,144 tons, $25,312, in 1923; 617 tons, $14,489, in 1924; and 1,055 tons, $17,574, in 1925.

FULLER'S EARTH

Fuller's earth sold or used by producers in the United States, 1916–1925

Year	Number of operators	Short tons	Value	Year	Number of operators	Short tons	Value
1916	10	67,822	$706,951	1921	12	105,609	$1,973,848
1917	11	72,567	772,087	1922	15	138,944	2,289,719
1918	14	84,468	1,146,354	1923	15	149,134	2,247,523
1919	10	106,145	1,998,829	1924	13	177,994	2,632,342
1920	12	128,487	2,506,189	1925	14	206,574	2,923,965

Fuller's earth imported for consumption in the United States, 1916–1925

Year	Short tons	Value	Year	Short tons	Value
1916	16,801	$139,664	1921	9,744	$119,415
1917	16,994	176,417	1922	10,569	135,695
1918	16,922	226,235	1923	8,547	113,944
1919	13,873	189,711	1924	7,302	92,488
1920	19,015	221,893	1925	8,015	111,295

Exports of fuller's earth are not reported separately.

GARNET (ABRASIVE)

[See Abrasive materials]

GAS (NATURAL)

Natural gas produced in the United States and delivered to consumers, 1916–1925

[Value at point of consumption]

Year	M cubic feet	Value	Year	M cubic feet	Value
1916	753,170,000	$120,227,000	1921	662,052,000	$174,617,000
1917	795,110,000	142,089,000	1922	762,546,000	221,535,000
1918	721,001,000	153,554,000	1923	1,006,976,000	240,001,000
1919	745,916,000	160,888,000	1924	1,141,521,000	253,856,000
1920	798,210,000	196,194,000	1925	1,188,571,000	265,271,000

Natural gas produced in the United States and delivered to consumers, 1924 and 1925, by States

[Value at point of consumption]

State	1924		1925	
	M cubic feet	Value	M cubic feet	Value
Arkansas	36,616,000	$4,908,000	41,878,000	$5,394,000
California	189,692,000	35,949,000	187,789,000	32,587,000
Colorado	47,600	1,700	574,400	61,100
Illinois	4,072,000	759,000	4,165,000	865,000
Indiana	998,000	494,000	1,168,000	504,000
Kansas	25,580,000	10,087,000	26,917,000	9,991,000
Kentucky	12,875,000	3,432,000	10,770,000	3,213,000
Louisiana	160,945,000	7,626,000	152,620,000	8,125,000
Michigan	600	300	400	200
Missouri	71,000	61,000	34,000	29,700
Montana	1,071,000	272,350	1,496,000	350,000
New York	6,196,000	3,632,000	6,210,000	3,778,000
Ohio	47,396,000	24,203,000	43,235,000	22,377,000
Oklahoma	214,452,000	31,045,700	249,285,000	36,121,000
Pennsylvania	105,863,000	45,546,000	101,632,000	47,098,000
South Dakota	3,000	2,500	4,200	2,300
Tennessee	1,200	450	8,500	2,000
Texas	107,247,000	13,748,000	134,872,000	19,715,000
West Virginia	182,285,000	68,000,000	180,345,000	70,903,000
Wyoming	46,036,000	4,081,000	45,539,000	4,149,000
Other [1]	73,600	7,000	28,500	5,700
	1,141,521,000	253,856,000	1,188,571,000	265,271,000

[1] 1924: Alaska, Iowa, and North Dakota; 1925: Alaska, Iowa, New Mexico, and North Dakota.

GASOLINE FROM NATURAL GAS

Natural-gas gasoline produced in the United States, 1916–1925

Year	Raw (unblended) gasoline produced		Natural gas treated (estimated) (M cubic feet)
	Gallons	Value at plant	
1916	103,492,689	$14,331,148	208,705,000
1917	217,884,104	40,188,956	429,288,000
1918	282,535,550	50,363,535	449,109,000
1919	351,535,026	64,196,763	480,404,000
1920	384,743,922	71,788,122	496,431,000
1921	449,934,402	61,815,258	465,097,000
1922	505,832,000	72,711,063	545,139,000
1923	816,226,000	77,268,000	875,711,000
1924	933,861,000	82,233,000	1,016,276,000
1925	1,127,470,000	120,383,000	1,040,390,000

Natural-gas gasoline produced in the United States, 1924 and 1925, by States

State	1924		1925	
	Gallons	Value	Gallons	Value
Alaska			33,000	$5,000
Arkansas	17,533,000	$1,784,000	19,686,000	2,420,000
California	232,579,000	22,690,000	303,180,000	32,743,000
Colorado			35,000	4,000
Illinois	9,091,000	795,000	9,874,000	1,102,000
Kansas	11,658,000	913,000	19,592,000	2,223,000
Kentucky	7,274,000	769,000	7,685,000	884,000
Louisiana	48,098,000	3,887,000	43,489,000	4,216,000
New York	477,000	50,000	414,000	46,000
Ohio	9,443,000	1,148,000	8,701,000	990,000
Oklahoma	301,062,000	23,338,000	390,861,000	40,973,000
Pennsylvania	19,254,000	2,266,000	18,850,000	2,185,000
Texas	186,571,000	14,460,000	214,092,000	22,606,000
West Virginia	61,549,000	7,154,000	58,201,000	6,759,000
Wyoming	29,272,000	2,979,000	32,777,000	3,227,000
	933,861,000	82,233,000	1,127,470,000	120,383,000

GEMS AND PRECIOUS STONES

Value of precious stones produced in the United States, 1916–1923 [1]

Year	Value	Year	Value
1916	$217,793	1920	$265,205
1917	131,012	1921	[2] 518,280
1918	106,523	1922	[2] 71,106
1919	111,763	1923 (estimate)	65,000

[1] Canvass discontinued after 1923.
[2] Production of diamond in Arkansas not reported

Value of diamonds and other precious stones imported for consumption in the United States, 1916–1925

Year	Diamonds				Other stones not set	Total, excluding pearls	Pearls
	Glazier's	Dust and bort	Rough or uncut	Cut but not set			
1916	$836,018	$67,290	$11,441,328	$24,282,140	$2,303,351	$38,930,127	$11,336,971
1917	1,098,102	349,746	13,092,855	18,421,838	1,883,810	34,846,351	4,947,509
1918	718,397	475,870	12,636,024	7,734,150	1,102,398	22,666,839	765,929
1919	984,381	1,420,442	20,306,758	64,085,610	5,161,639	91,958,830	11,008,973
1920	1,527,753	3,387,488	10,526,125	45,240,013	5,419,363	66,100,742	7,879,384
1921	435,872	466,345	2,207,365	26,144,323	2,778,931	32,032,836	4,492,063
1922	839,882	1,029,261	8,332,416	43,144,742	3,723,062	57,069,363	8,546,574
1923	1,065,834	228,409	7,241,550	51,975,896	5,703,279	66,214,968	7,932,929
1924	1,116,862	259,482	11,666,587	47,108,169	5,214,130	65,365,230	5,898,560
1925	1,976,640	760,476	9,492,328	49,723,818	5,228,011	67,181,273	6,734,149

Domestic exports in 1922 were as follows: "Diamonds, cut but not set," 15 carats, valued at $1,540; "other precious stones, including pearls," $21,525. Data are not separately classified prior to 1922. For 1923 to 1925, domestic exports are recorded as "precious stones, including pearls," as follows: 1923, $78,967; 1924, $146,825; 1925, $39,823.

Value of foreign precious stones reexported from the United States, 1916–1925

Year	Diamonds			Other precious stones		Total, excluding pearls	Pearls and parts of, not strung or set
	Uncut	Cut but not set	Bort	Uncut	Cut but not set		
1916	$6,979	$9,342	$4	$9,023	$48,352	$73,700	$894,115
1917	7,757	400	14,962	1,512	16,842	41,473	20,353
1918	----	----	56	100	57	213	42,908
1919	3,238	25,000	(1)	[1] 15,653	1,783	45,674	5,386
1920	----	----	(1)	[1] 4,604	13,338	17,942	8,000
1921	----	896	(1)	[1] 14,390	9,353	24,639	128
1922	19,735	1,396	(1)	[1] 7,387	7,546	36,064	728
1923–1925	(2)	(2)	(2)	(2)	(2)	(2)	(2)

[1] Bort included under "Other precious stones—uncut."
[2] Foreign exports for 1923 to 1925 are recorded as "Diamonds and precious stones," as follows: 1923, 535,840 carats, valued at $27,123; 1924, 47,797 carats, $69,230; 1925, 32,959 carats, $26,983.

GOLD AND SILVER [1]

Gold and silver produced in the United States, 1916–1925

Year	Gold		Silver	
	Troy ounces	Value	Troy ounces	Commercial value
1916	4,479,056	$92,590,300	74,414,802	$48,953,000
1917	4,051,440	83,750,700	71,740,362	59,078,100
1918	3,320,784	68,646,700	67,810,139	66,485,129
1919	2,918,628	60,333,400	56,682,445	63,533,652
1920	2,476,166	51,186,900	55,361,573	60,801,955
1921	2,422,006	50,067,300	53,052,441	53,052,441
1922	2,363,075	48,849,100	56,240,048	56,240,048
1923	2,502,632	51,734,000	73,335,170	60,134,839
1924	2,528,900	52,277,000	65,407,186	43,822,814
1925	2,411,987	49,860,200	66,155,424	45,911,864

[1] Gold is valued by law at $20.67+a troy ounce. For prices of silver, see statement on p. A15.

Gold produced in the United States, 1924 and 1925, by States [1]

State	1924		1925	
	Troy ounces	Value [2]	Troy ounces	Value [2]
Alaska	303,553	$6,275,000	301,212	$6,226,600
Arizona	226,385	4,679,800	204,471	4,226,800
California	633,021	13,085,700	641,849	13,268,200
Colorado	420,858	8,699,900	357,036	7,380,600
Georgia	24	500	460	9,500
Idaho	27,085	559,900	19,974	412,900
Montana	95,815	1,980,700	84,022	1,736,900
Nevada	219,976	4,547,300	180,352	3,728,200
New Mexico	26,742	552,800	29,572	611,300
North Carolina	97	2,000	885	18,300
Oregon	27,622	571,000	18,707	386,700
Pennsylvania	213	4,400	121	2,500
Philippine Islands	82,562	1,706,700	92,067	1,903,200
Porto Rico	10	200	87	1,800
South Dakota	297,085	6,141,300	288,160	5,956,800
Tennessee	329	6,800	358	7,400
Texas			5	100
Utah	153,378	3,170,600	181,169	3,745,100
Virginia	5	100	5	100
Washington	14,130	292,100	11,465	237,000
Wyoming	10	200	10	200
	2,528,900	52,277,000	2,411,987	49,860,200

[1] Figures furnished by the Bureau of the Mint.

[2] Gold value, $20.67+a troy ounce.

Silver produced in the United States, 1924 and 1925, by States [1]

State	1924		1925	
	Troy ounces	Value [2]	Troy ounces	Value [2]
Alaska	690,781	$462,823	766,096	$531,671
Arizona	6,390,684	4,281,758	7,371,358	5,115,722
Arkansas			2,835	1,968
California	3,598,733	2,411,153	3,240,400	2,248,838
Colorado	3,549,903	2,378,435	4,434,890	3,077,814
Georgia			47	33
Idaho	8,036,358	5,384,359	7,663,437	5,318,425
Illinois	9,500	6,365	3,674	2,550
Michigan	155,372	104,099	135,921	94,329
Missouri	86,201	57,754	44,238	30,701
Montana	13,688,728	9,171,447	12,596,609	8,742,047
Nevada	9,333,197	6,253,242	6,846,806	4,751,683
New Mexico	834,933	559,405	799,673	554,973
North Carolina	24	16	109	76
Oregon	45,143	30,246	35,275	24,481
Pennsylvania	2,800	1,876	1,458	1,012
Philippine Islands	40,346	27,032	48,502	33,660
Porto Rico	11	7	195	135
South Dakota	89,417	59,909	98,234	68,174
Tennessee	95,542	64,013	104,303	72,386
Texas	718,425	481,345	555,173	385,290
Utah	17,821,716	11,940,551	21,240,515	14,740,917
Virginia			5	3
Washington	219,372	146,979	165,565	114,902
Wyoming			106	74
	65,407,186	43,822,814	66,155,424	45,911,864

[1] Figures furnished by the Bureau of the Mint.
[2] Valued at average New York price of bar silver, as follows: 1924, 67 cents an ounce; 1925, 69.4 cents an ounce.

Value of gold and silver imported into and exported from the United States, 1916–1925

Year	Gold		Silver	
	Imports	Exports	Imports	Exports
1916	$685,990,234	$155,792,927	$32,263,289	$70,595,037
1917	552,454,374	371,883,884	53,340,477	84,130,876
1918	62,042,748	41,069,818	71,375,699	252,846,464
1919	76,534,046	368,185,248	89,410,018	239,021,051
1920	417,068,273	322,091,208	88,060,041	113,616,224
1921	691,248,297	23,891,377	63,242,671	51,575,399
1922	275,169,785	36,874,894	70,806,653	62,807,286
1923	322,715,812	28,643,417	74,453,530	72,468,789
1924	319,720,918	61,648,313	73,944,902	109,891,038
1925	128,273,172	262,639,790	64,595,418	99,127,585

Value of gold and silver imported into and exported from the United States, 1924 and 1925, by classes

	Imports	Exports	Excess of—	
			Imports	Exports
1924				
Gold:				
Contained in domestic ore and base bullion		$245,817		$245,817
Contained in foreign ore and base bullion	$22,589,649		$22,589,649	
Domestic bullion refined		26,838,091		26,838,091
Foreign bullion refined	196,009,351	21	196,009,330	
United States coin	29,213,499	33,225,446		4,011,947
Foreign coin	71,908,419	1,338,938	70,569,481	
	319,720,918	61,648,313	289,168,460	31,095,855
Excess imports over exports			258,072,605	
Silver:				
Contained in domestic ore and base bullion		28,650		28,650
Contained in foreign ore and base bullion	38,919,408		38,919,408	
Domestic bullion refined		90,851,274		90,851,274
Foreign bullion refined	33,441,610	14,225,232	19,216,378	
United States coin	683,023	280,465	402,558	
Foreign coin	900,861	4,505,412		3,604,551
	73,944,902	109,891,033	58,538,344	94,484,475
Excess exports over imports				35,946,131
1925				
Gold:				
Contained in domestic ore and base bullion		144,480		144,480
Contained in foreign ore and base bullion	16,205,097		16,205,097	
Domestic bullion refined	5,041,364	105,995,453		100,954,089
Foreign bullion refined	91,893,425	360	91,893,065	
United States coin	11,210,631	156,123,273		144,912,642
Foreign coin	3,922,655	376,224	3,546,431	
	128,273,172	262,639,790	111,644,593	246,011,211
Excess exports over imports				134,366,618
Silver:				
Contained in domestic ore and base bullion		33,250		33,250
Contained in foreign ore and base bullion	33,134,911		33,134,911	
Domestic bullion refined		81,451,173		81,451,173
Foreign bullion refined	29,899,214	13,157,833	16,741,381	
United States coin	999,100	318,235	680,865	
Foreign coin	562,193	4,167,094		3,604,901
	64,595,418	99,127,585	50,557,157	85,089,324
Excess exports over imports				34,532,167

GRAPHITE

Natural graphite sold by producers in the United States, 1916–1925

Year	Amorphous		Crystalline	
	Short tons	Value	Pounds	Value
1916	2,622	$20,723	10,931,989	$914,748
1917	8,301	73,481	10,584,080	1,094,398
1918	6,560	69,455	12,861,839	1,454,799
1919	3,379	47,716	8,086,191	731,141
1920	4,694	49,758	9,632,360	576,444
1921	1,842	20,860	1,189,523	75,664
1922	2,200	[1]	1,849,766	85,242
1923	4,056	39,560	3,964,900	151,434
1924	4,071	38,533	1,800,325	48,977
1925	3,536	39,640	2,257,250	56,721

[1] Bureau of Mines not at liberty to publish value.

Graphite is manufactured by the Acheson Graphite Co. at Niagara Falls, N. Y. The figures given below are published by permission of this company.

Graphite manufactured by the Acheson Graphite Co., 1916–1925, in pounds

1916	8,397,281	1921	5,888,000
1917	10,474,649	1922	13,031,926
1918	9,182,272	1923	26,761,015
1919	8,163,177	1924	10,986,192
1920	7,399,749	1925	12,135,655

Graphite imported into and exported from the United States, 1916–1925

Year	Imports for consumption		Exports		
	Short tons	Value	Unmanufactured		Manufactures of
			Short tons	Value	
1916	42,930	$7,279,883	798	$98,118	$1,339,259
1917	42,577	8,961,988	2,573	349,563	891,687
1918	19,498	3,092,475	954	121,555	731,518
1919	26,626	2,978,096	629	90,185	788,755
1920	21,095	1,711,312	607	112,771	610,261
1921	8,183	452,076	921	95,998	679,359
1922	12,488	473,046	569	78,094	[1] 255,019
1923	[2] 19,434	[2] 614,119	908	138,542	[1] 335,778
1924	[2] 16,375	[2] 399,511	1,022	144,108	[1] 250,957
1925[3]	[2] 17,768	[2] 826,410	945	142,122	[1] 337,481

[1] Exclusive of crucibles, figures for which are not available.
[2] Composed of the following: 1923, "amorphous" 11,252 tons, $149,831; "crystalline chip or dust" 7,243 tons, $426,417; and "crystalline flake" 939 tons, $37,871; 1924, 10,936 tons, $113,751; 3,998 tons, $197,867; and 1,441 tons, $87,893; and 1925, 9,210 tons, $143,750; 5,904 tons, $389,242, and 2,654 tons, $293,418, respectively. Classes not separately shown for earlier years.
[3] Imports of graphite crucibles were not separately classified until 1925 when 3,100 crucibles, valued at $548, were imported. Weight not recorded.

GRINDSTONES AND PULPSTONES

[See Abrasive materials]

GYPSUM

Gypsum produced in the United States and sold by producers, 1916–1925

Year	Crude produced (short tons)	Crude and calcined sold (total value)	Year	Crude produced (short tons)	Crude and calcined sold (total value)
1916	2,757,730	$7,959,032	1921	2,890,784	$23,700,290
1917	2,696,226	11,116,452	1922	3,779,949	29,361,151
1918	2,057,015	11,470,854	1923	4,753,448	34,888,155
1919	2,420,163	15,727,907	1924	5,042,629	42,724,507
1920	3,129,142	24,533,065	1925	5,678,302	47,577,240

Gypsum imported for consumption in the United States, 1916–1925

Year	Crude		Ground or calcined		Value of manufactured plaster of Paris	Keenes cement		Total value
	Short tons	Value	Short tons	Value		Short tons	Value	
1916	254, 131	$275, 043	11, 706	$72, 345	$9, 085	600	$9, 890	$366, 363
1917	240, 269	265, 504	16, 533	109, 732	6, 016	484	8, 003	389, 255
1918	50, 653	55, 004	6, 117	70, 028	1, 765	111	2, 259	129, 056
1919	171, 733	211, 946	10, 415	126, 405	7, 719	187	5, 984	352, 054
1920	282, 486	397, 942	14, 921	179, 191	10, 282	202	5, 338	592, 753
1921	266, 796	364, 318	4, 495	55, 109	33, 072	184	6, 836	459, 335
1922	409, 475	523, 939	1, 774	32, 651	55, 116	403	9, 636	621, 342
1923	448, 129	629, 203	5, 133	77, 716	41, 317	418	11, 543	759, 779
1924	519, 627	724, 864	5, 217	70, 793	48, 059	539	12, 042	855, 758
1925	634, 423	915, 888	10, 759	140, 941	56, 724	449	11, 294	1, 124, 847

Exports of gypsum are designated as "gypsum or plaster, crude, ground, calcined, and manufactures of," and have been as follows: 1925, 16,798 short tons, valued at $498,616; 1924, 10,623 tons, $358,425; 1923, 8,815 tons, $226,423; 1922, 7,673 tons, $178,166. Exports are not separately classified for earlier years.

ILMENITE

[See Titanium minerals]

IRON ORE, PIG IRON, AND STEEL

IRON ORE

[Exclusive of all domestic ore containing 5 per cent or more of manganese. For data regarding such ore, see Manganese]

Iron ore mined in the United States, 1916–1925, by varieties, in long tons

Year	Hematite	Brown ore	Magnetite	Carbonate	Total
1916	70, 728, 024	1, 904, 484	2, 533, 364	1, 800	75, 167, 672
1917	70, 743, 513	1, 992, 332	2, 553, 006	----------	75, 288, 851
1918	65, 894, 709	1, 613, 844	2, 149, 725	----------	69, 658, 278
1919	[1] 57, 719, 582	1, 127, 397	[1] 2, 118, 439	----------	60, 965, 418
1920	[1] [2] 63, 883, 523	[2] 1, 325, 661	[1] 2, 391, 541	3, 740	67, 604, 465
1921	[1] [2] 28, 337, 249	[2] 370, 154	[1] 780, 866	2, 709	29, 490, 978
1922	[2] 44, 888, 723	[2] 783, 582	1, 452, 966	3, 256	47, 128, 527
1923	[2] 65, 924, 454	[2] 1, 232, 848	2, 190, 624	3, 516	69, 351, 442
1924	[2] 52, 102, 300	[2] 814, 159	1, 347, 711	3, 249	54, 267, 419
1925	[2] 59, 546, 690	[2] 884, 600	1, 472, 004	4, 703	61, 907, 997

[1] Some magnetite included with hematite. [2] Some hematite included with brown ore.

Iron ore mined in the United States, 1924 and 1925, by mining districts and varieties, in long tons

District	Hematite	Brown ore	Magnetite	Carbonate	Total
1924					
Lake Superior [1]	44,796,766		44,953		44,841,719
Birmingham	6,214,381	296,931			6,511,312
Chattanooga	376,693	171,004			547,697
Adirondack			197,437		197,437
Northern New Jersey and southeastern New York			110,626		110,626
Other districts	[2] 714,460	[2] 346,224	994,695	3,249	2,058,628
	[2] 52,102,300	[2] 814,159	1,347,711	3,249	54,267,419
1925					
Lake Superior [1]	52,056,663				52,056,663
Birmingham	6,312,207	323,599			6,635,806
Chattanooga	259,843	96,877			356,720
Adirondack Northern New Jersey and southeastern New York			328,745		328,745
Other districts	[2] 917,977	[2] 464,124	1,143,259	4,703	2,530,063
	[2] 59,546,690	[2] 884,600	1,472,004	4,703	61,907,997

[1] Includes only those mines in Wisconsin which are in the true Lake Superior district.
[2] Some hematite included with brown ore.

Iron ore mined in the Lake Superior district, 1916–1925, by ranges, in long tons

Year	Marquette	Menominee	Gogebic	Vermilion	Mesabi	Cuyuna	Total
1916	4,792,987	6,649,578	7,707,101	1,704,440	41,325,341	1,555,641	63,735,088
1917	4,638,374	6,366,483	7,881,232	1,481,301	41,127,323	1,986,608	63,481,321
1918	3,946,554	6,041,637	7,837,634	1,192,677	30,055,977	1,705,315	59,779,794
1919	4,158,751	4,863,968	7,368,994	1,051,795	33,262,954	1,685,877	52,392,339
1920	4,457,609	5,651,542	8,298,206	1,053,518	36,641,880	1,757,775	57,860,530
1921	2,204,114	2,147,569	3,135,477	981,576	16,380,190	449,559	25,298,485
1922	2,745,626	3,290,641	4,910,789	1,108,764	26,704,601	955,595	39,716,016
1923	3,910,909	4,913,541	6,112,662	1,119,113	41,809,018	1,420,165	59,285,408
1924	3,579,087	3,780,664	5,579,883	1,141,690	29,818,965	941,430	44,841,719
1925	3,813,687	5,009,022	6,377,710	1,331,753	34,851,109	673,382	52,056,663

Iron ore shipped from mines in the United States, 1916–1925

[Exclusive of ore sold for paint. See p. A67]

Year	Long tons	Value	Year	Long tons	Value
1916	77,870,553	$181,902,277	1921	26,652,528	$89,745,308
1917	75,573,207	238,260,444	1922	50,612,620	157,809,286
1918	72,021,202	244,368,147	1923	69,811,472	240,738,921
1919	56,372,784	197,312,517	1924	52,083,375	151,307,105
1920	69,281,341	285,006,327	1925	63,924,763	160,796,886

Iron ore shipped from mines in the United States, 1924 and 1925, by States

[Exclusive of ore sold for paint. See p. A67]

State	1924		1925	
	Long tons	Value	Long tons	Value
Alabama	6,557,596	$13,927,551	6,891,081	$14,134,677
California	435	(1)	352	(1)
Colorado	4,702	(1)	8,642	(1)
Georgia	112,059	285,128	79,488	231,683
Michigan	11,248,641	35,605,902	15,254,003	40,926,315
Minnesota	31,076,114	93,311,092	38,022,237	96,083,485
Missouri	79,847	405,622	40,043	(1)
Montana	3,913	10,846	3,672	10,244
New Jersey	101,123	420,488	164,523	678,021
New Mexico	189,371	(1)	172,959	(1)
New York	303,386	1,448,616	413,517	1,988,735
North Carolina	12,525	32,512	22,011	49,511
Ohio	244	(1)	2,410	(1)
Pennsylvania	807,411	1,881,122	917,255	2,149,800
Tennessee	179,293	431,682	164,073	369,144
Utah	164,154	234,348	268,529	361,251
Virginia	91,759	250,279	76,302	174,454
Washington	1,700	(1)	830	(1)
Wisconsin	786,006	2,044,762	933,214	2,260,388
Wyoming	363,096	(1)	489,622	(1)
Undistributed		[2] 1,017,155		[2] 1,379,178
	52,083,375	151,307,105	63,924,763	160,796,886

[1] Included under "Undistributed." [2] This figure covers States entered as "(1)" above.

Stocks of iron ore at mines in the United States, December 31, 1916–1925, in long tons

1916	10,835,224	1921	13,836,267
1917	11,003,843	1922	10,524,279
1918	8,565,893	1923	10,165,875
1919	13,097,500	1924	12,410,619
1920	11,378,794	1925	10,795,630

Stocks of iron ore at mines in the United States, December 31, 1924 and 1925, in long tons

State	1924	1925	State	1924	1925
Alabama	740,279	942,448	New York	441,492	153,776
Georgia	653		Pennsylvania	1,200	37,607
Iowa	12,165	12,165	Utah		1,934
Michigan	7,399,505	6,769,006	Virginia	6,503	26,473
Minnesota	3,537,237	2,645,543	Wisconsin	159,045	54,075
Missouri	3,079	2,629			
New Jersey	109,461	149,974		12,410,619	10,795,630

Iron ore imported into and exported from the United States, 1916–1925

Year	Imports		Exports	
	Long tons	Value	Long tons	Value
1916	1,325,736	$4,566,514	1,183,952	$3,702,496
1917	971,663	3,655,392	1,132,313	4,464,111
1918	787,468	3,464,304	1,256,383	5,535,090
1919	476,461	2,385,689	996,569	4,308,746
1920	1,273,456	4,963,654	1,145,037	6,198,927
1921	315,768	1,075,909	440,106	2,077,620
1922	1,135,156	4,916,294	602,194	2,770,878
1923	2,768,430	11,308,503	1,116,932	5,305,365
1924	2,047,055	10,580,904	595,413	2,407,003
1925	2,190,697	6,895,229	630,521	2,411,093

PIG IRON

Pig iron shipped from blast furnaces in the United States, 1916–1925

Year	Long tons	Value	Year	Long tons	Value
1916	39, 126, 324	$663, 478, 118	1921	16, 038, 619	$389, 437, 792
1917	38, 612, 546	1, 053, 785, 975	1922	27, 670, 738	608, 144, 858
1918	38, 230, 440	1, 180, 759, 565	1923	38, 361, 379	946, 799, 378
1919	30, 130, 231	775, 915, 043	1924	31, 064, 129	665, 078, 972
1920	35, 710, 227	1, 140, 904, 096	1925	36, 814, 702	739, 316, 333

Pig iron shipped from blast furnaces in the United States, 1924 and 1925, by States

State	1924		1925	
	Long tons	Value	Long tons	Value
Alabama	2, 667, 361	$55, 791, 228	2, 910, 370	$57, 777, 275
Colorado	(1)	(1)	(1)	(1)
Illinois	2, 695, 961	59, 299, 519	3, 600, 484	74, 937, 781
Indiana	2, 571, 411	52, 507, 720	3, 350, 747	64, 807, 575
Kentucky	99, 055	(1)	153, 935	(1)
Maryland	539, 188	(1)	693, 523	(1)
Massachusetts	50	(1)		
Michigan	650, 333	15, 225, 990	831, 435	18, 452, 346
Minnesota	189, 033	(1)	276, 240	(1)
Missouri	21, 371	(1)	3, 758	(1)
New Jersey	(1)	(1)	(1)	(1)
New York	1, 914, 545	38, 150, 486	2, 151, 036	40, 435, 443
Ohio	7, 434, 487	159, 701, 131	8, 857, 615	173, 418, 068
Pennsylvania	10, 962, 288	237, 052, 035	12, 537, 809	258, 140, 674
Tennessee	126, 660	2, 782, 154	95, 186	2, 014, 176
Utah	(1)	(1)	126, 746	(1)
Virginia	94, 462	2, 268, 022	97, 884	2, 237, 749
West Virginia	453, 944	9, 884, 019	499, 047	9, 416, 095
Wisconsin	172, 435	3, 945, 369	226, 712	4, 836, 952
Undistributed	[2] 471, 545	[2] 28, 471, 299	[2] 402, 175	[2] 32, 842, 199
	31, 064, 129	665, 078, 972	36, 814, 702	739, 316, 333

[1] Included under "Undistributed." [2] This figure covers States entered as "(1)" above.

Pig iron[1] imported into and exported from the United States, 1916–1925

Year	Imports		Exports	
	Long tons	Value	Long tons	Value
1916 [1]	135, 349	$10, 239, 868	607, 236	$15, 381, 431
1917 [1]	76, 786	7, 872, 105	656, 220	24, 037, 051
1918 [1]	34, 711	4, 968, 056	269, 575	11, 576, 721
1919 [1]	101, 665	6, 565, 106	321, 261	12, 313, 183
1920 [1]	185, 944	12, 801, 834	216, 828	10, 074, 377
1921 [1]	44, 036	2, 014, 926	28, 307	933, 093
1922	383, 445	8, 670, 860	30, 920	756, 842
1923	367, 778	9. 005, 077	32, 318	862, 443
1924	208, 109	3, 741, 213	41, 483	957, 921
1925	441, 425	7, 951, 283	32, 674	724, 565

[1] Figures for 1916 to 1921 include ferro-alloys. Separate data not available prior to 1922.

STEEL

Steel produced in the United States, 1916–1925, in long tons [1]

Year	Bessemer	Open-hearth	Crucible	Other steel	Total
1916	11,059,039	31,415,427	129,692	169,522	42,773,680
1917	10,479,960	34,148,893	126,716	305,038	45,060,607
1918	9,376,236	34,459,391	115,112	511,693	44,462,432
1919	7,271,562	26,948,694	63,572	387,404	34,671,232
1920	8,883,087	32,671,895	72,265	505,687	42,132,934
1921	4,015,938	15,589,802	7,613	170,444	19,783,797
1922	5,919,298	29,308,983	28,606	346,039	35,602,926
1923	8,484,088	35,899,657	44,079	515,872	44,943,696
1924	5,899,590	31,577,350	22,473	432,526	37,931,939
1925	6,723,962	38,034,488	19,562	615,512	45,393,524

[1] According to the American Iron and Steel Institute.

LEAD [1]

Refined primary lead produced in the United States from domestic ores, 1916–1925

Year	Short tons	Value	Year	Short tons	Value
1916	552,228	$76,207,000	1921	398,222	$35,840,000
1917	548,450	94,333,000	1922	468,746	51,562,000
1918	539,905	76,667,000	1923	543,841	76,138,000
1919	424,433	44,990,000	1924	566,407	90,625,000
1920	476,849	76,296,000	1925	654,921	113,956,000

[1] For prices of lead, see statement on p. A15.

Refined primary lead produced in the United States, 1921–1925, in short tons

	1921	1922	1923	1924	1925
Domestic ore:					
Desilverized lead	187,962	185,191	291,760	299,343	345,429
Soft lead	157,513	209,250	190,749	203,615	260,560
Desilverized soft lead	52,747	74,305	61,332	63,449	48,932
Total from domestic ore	398,222	468,746	543,841	566,407	654,921
Foreign ore:					
Africa			99	6	
Canada	2,877	3,604	3,632	4,633	10,676
Central America	6	14	18	30	6
Mexico	1,912	7,260	18,867	33,328	31,107
South America	2,235	2,458	1,461	7,663	4,496
Other foreign	90	562	211	725	739
Foreign base bullion:					
Canada	1,599	2,900			
Mexico	41,648	47,118	50,193	77,701	65,024
Total from foreign ore and base bullion	50,367	63,916	74,481	124,086	112,048
Grand total from all sources	448,589	532,662	618,322	690,493	766,969
Production of antimonial lead	10,064	8,075	14,190	20,787	19,667

Secondary lead recovered in the United States, 1916–1925

Year	Pig lead (short tons)	Lead in alloys (short tons)	Total	
			Short tons	Value
1916	56,700	39,600	96,300	$13,289,000
1917	45,100	48,400	93,500	16,082,000
1918	41,146	55,954	97,100	13,788,000
1919	55,684	66,416	122,100	12,943,000
1920	56,350	68,300	124,650	19,944,000
1921	46,370	57,410	103,780	9,340,000
1922	75,480	84,080	159,560	17,552,000
1923	96,430	98,060	194,490	27,229,000
1924	90,400	114,100	204,500	32,720,000
1925	112,420	114,460	226,880	39,477,100

Lead imported for consumption in the United States, 1916–1925, by classes

Year	Lead in ore [1]		Base bullion		Pigs, bars, and old [2]		Sheets, pipe, and shot		Not otherwise specified (value)	Total value
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value		
1916	10,125,983	$368,824	5,242,171	$208,277	6,388,097	$331,235	532	$63	$106,560	$1,014,959
1917	5,438,931	207,370	6,965,849	470,539	1,756,223	85,743	12,538	2,699	10,287	776,638
1918	6,064,902	344,080	3,559,071	180,070	1,139,950	56,694	6,892	624	36,723	618,191
1919	4,106,823	196,363	31,796,693	1,130,937	10,174,115	415,094	8,018	628	17,187	1,760,209
1920	13,700,499	908,619	66,816,820	3,340,600	68,901,959	3,887,821	81,396	5,483	21,328	8,163,851
1921	6,842,807	327,046	56,819,980	1,668,410	61,909,094	1,972,716	3,087	140	11,204	3,979,516
1922	23,649,851	812,603	55,859,422	1,815,142	8,563,110	335,924	6,018	697	12,286	2,976,652
1923	22,420,046	1,190,414	11,124,151	626,201	42,925,265	2,510,466	19,525	4,495	90,027	4,421,603
1924	65,147,976	3,145,791	28,796,402	1,542,167	27,362,392	1,850,862	11,666	4,384	138,637	6,681,841
1925	12,706,508	672,112	24,747,665	1,823,566	15,464,205	1,038,350	27,579	10,429	139,533	3,683,990

[1] Includes also lead in matte beginning Sept. 22, 1922, when new tariff went into effect.
[2] Includes also imports of antimonial lead, antimonial scrap lead, babbitt metal, solder, etc., beginning Sept. 22, 1922, when new tariff went into effect, except in 1925 when antimonial lead is excluded.

Lead imported into the United States in ore, base bullion, and refined, by sources, 1921–1925, in pounds

[General imports]

Year	Canada	Mexico	South America	Europe	Other countries	Total
1921	8,127,158	106,406,238	2,381,365	30,224,701	1,430,949	148,570,411
1922	8,663,236	141,216,136	3,803,478	1,454,384	513,335	155,650,569
1923	11,399,671	242,352,788	5,300,161	11,004,938	520,635	270,578,193
1924	11,022,091	243,161,069	15,820,867	4,857,805	453,432	275,315,264
1925	11,646,820	218,873,800	10,621,737	1,594,963	1,521,110	244,258,430

Lead imported into the United States, by classes, 1921–1925, in pounds

[General imports]

Year	Lead in ore (lead content)	Base bullion		Pigs, bars, sheets, and old	Total lead content
		Gross weight	Lead content		
1921	14,234,039	77,882,834	71,733,838	62,602,534	148,570,411
1922	24,474,481	[1]	124,074,465	7,101,623	155,650,569
1923	66,882,850	[1]	161,496,495	42,198,848	270,578,193
1924	95,320,168	[1]	155,501,350	24,493,746	275,315,264
1925	88,962,502	[1]	141,253,559	14,042,369	244,258,430

[1] Figures not available.

Lead exported from the United States, 1916–1925, by classes

Year	Pigs and bars				Foreign lead used in articles exported with benefit of drawback [1]	Manufactures of lead from both domestic and foreign ores
	From domestic ore		From foreign ore			
	Pounds	Value	Pounds	Value	Pounds	
1916	200,999,835	$13,494,065	19,760,086	$1,111,653	10,341,075	$2,522,957
1917	107,376,638	9,560,598	75,304,480	6,650,157	15,074,947	2,288,205
1918	83,662,322	5,889,381	118,832,344	8,309,798	6,852,173	1,828,473
1919	21,019,605	1,471,256	81,951,396	4,536,273	3,872,130	2,155,436
1920	5,459,713	462,223	34,725,501	2,570,535	12,350,794	3,621,397
1921	3,247,294	177,926	50,000,259	2,284,107	18,738,927	1,376,259
1922	11,645,821	604,605	64,709,305	3,177,360	11,354,070	1,158,150
1923	3,997,485	260,487	97,471,326	5,195,256	25,052,107	1,078,636
1924	10,664,083	711,147	153,515,863	9,685,619	30,549,116	1,965,555
1925	9,910,955	784,440	197,128,517	14,910,891	23,398,305	2,006,309

[1] Exclusive of lead that entered as pig and was exported in the same form, which would be duplicated in exports of lead from foreign ore.

LIME

Lime sold by producers in the United States, 1916–1925

Year	Hydrated			Total		
	Number of plants in operation	Short tons	Value [1]	Number of plants in operation	Short tons	Value [1]
1916	89	717,382	$3,626,998	778	4,073,433	$18,509,305
1917	90	709,157	4,643,004	595	3,786,364	23,807,877
1918	90	620,216	5,342,113	496	3,206,016	26,808,909
1919	93	777,408	7,061,146	539	3,330,347	29,448,553
1920	98	853,116	9,287,562	515	3,570,141	37,543,840
1921	105	792,970	7,421,637	520	2,532,153	24,895,370
1922	114	1,106,063	9,868,980	530	3,639,617	33,255,039
1923	121	1,225,928	12,229,598	467	4,076,243	39,993,652
1924	120	1,316,664	13,199,846	450	4,072,000	39,596,423
1925	134	1,560,848	15,287,461	450	4,580,823	42,609,141

[1] The value given represents the value of bulk lime f. o. b. at point of shipment and does not include cost of barrel or package.

Lime sold by producers in the United States, 1924 and 1925, by States

State	1924			1925		
	Number of plants in operation	Short tons	Value	Number of plants in operation	Short tons	Value
Alabama	10	204,059	$1,812,282	11	207,699	$1,679,155
Arizona	3	27,972	331,756	3	39,045	394,023
Arkansas	3	13,984	131,108	5	24,791	223,965
California	10	59,583	658,138	10	70,805	745,132
Colorado	4	(1)	(1)	3	(1)	(1)
Connecticut	6	58,851	796,541	6	58,449	672,821
Florida	2	(1)	(1)	3	17,793	186,650
Georgia	1	(1)	(1)	1	(1)	(1)
Hawaii	1	(1)	(1)	1	(1)	(1)
Idaho	1	(1)	(1)	1	(1)	(1)
Illinois	10	89,132	934,199	10	96,066	928,632
Indiana	7	116,927	991,003	7	127,878	1,067,040
Iowa	2	(1)	(1)	2	(1)	(1)
Kentucky	3	8,091	58,228	3	9,433	71,300
Maine	4	125,688	1,809,929	4	115,571	1,291,812
Maryland	11	56,178	470,105	12	64,518	524,100
Massachusetts	11	194,402	2,693,028	9	197,732	2,610,279
Michigan	7	73,096	702,072	8	95,036	909,952
Minnesota	4	25,764	319,066	3	(1)	(1)
Missouri	18	243,465	2,354,175	18	273,348	2,610,954
Montana	3	2,374	25,316	3	6,259	44,992
Nevada	1	(1)	(1)	1	(1)	(1)
New Jersey	3	204	1,516	2	(1)	(1)
New Mexico	3	2,389	23,975	3	1,329	14,010
New York	12	98,592	991,799	12	104,829	1,030,960
North Carolina	1	(1)	(1)	1	(1)	(1)
Ohio	32	934,407	9,511,270	33	1,089,385	10,970,605
Oklahoma	1	(1)	(1)	2	(1)	(1)
Oregon	2	(1)	(1)	1	(1)	(1)
Pennsylvania	136	700,380	5,634,806	142	794,951	6,425,675
Porto Rico	19	8,264	132,365	18	9,988	148,326
Rhode Island	1	(1)	(1)	1	(1)	(1)
South Dakota	2	(1)	(1)	2	(1)	(1)
Tennessee	18	144,292	1,111,781	14	175,685	1,344,508
Texas	5	60,565	570,334	6	74,638	698,138
Utah	10	12,853	172,434	9	22,062	265,060
Vermont	10	56,484	710,739	10	66,245	788,936
Virginia	31	172,776	1,409,447	30	192,429	1,491,568
Washington	6	28,188	353,450	6	29,636	357,297
West Virginia	10	238,714	1,884,682	9	270,895	1,879,223
Wisconsin	25	235,030	2,129,701	25	244,903	2,204,504
Wyoming	1	(1)	(1)			
Undistributed		79,296	871,178		99,415	1,029,524
	450	4,072,000	39,596,423	450	4,580,823	42,609,141

[1] Included under "Undistributed."

Lime imported into and exported from the United States, 1916–1925

Year	Imports for consumption		Exports	
	Short tons	Value	Short tons	Value
1916	7,959	$71,663	23,973	$132,769
1917	7,353	70,505	18,794	168,671
1918	6,650	73,458	7,191	105,803
1919	8,679	128,519	6,372	108,370
1920	22,688	392,137	5,921	128,296
1921	10,811	234,798	5,192	109,769
1922	14,112	290,845	8,289	116,649
1923	25,407	428,903	11,789	170,289
1924	20,480	377,994	14,905	212,340
1925	15,323	285,599	14,800	218,696

LITHIUM MINERALS

Lithium minerals produced in the United States, 1916–1925

Year	Short tons	Value	Year	Short tons	Value
1916	619	$12,035	1921	1,833	$33,508
1917	2,062	42,912	1922	2,192	41,300
1918	5,894	111,600	1923	2,310	38,800
1919	6,287	115,000	1924	2,996	62,391
1920	11,696	173,002	1925	3,140	58,500

Imports and exports of lithium minerals are not reported separately.

LITHOGRAPHIC STONE

Production of lithographic stone in the United States in 1916 to 1918 was as follows: 1916, 40,000 pounds, valued at $1,500; 1917, 5,832 pounds, $489; 1918, 6,000 pounds, $350. No domestic production has been reported since 1918.

Lithographic stone imported for consumption in the United States, 1916–1925

Year	Pounds	Value	Year	Pounds	Value
1916	(1)	$749	1921	301,546	$34,101
1917			1922	256,426	28,242
1918			1923	225,600	24,861
1919	464,914	216,293	1924	133,674	9,046
1920	786,119	63,733	1925	186,971	20,263

[1] Quantity not recorded.

No exports of lithographic stone are reported.

MAGNESITE

Domestic magnesite (expressed as equivalent crude) sold or treated in the United States, 1916–1925

Year	California		Washington		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1916	154, 259	$1, 388, 331	715	$5, 362	154, 974	$1, 393, 693
1917	211, 663	2, 116, 630	105, 175	783, 188	316, 838	2, 899, 818
1918	84, 077	761, 811	147, 528	1, 050, 790	231, 605	1, 812, 601
1919	50, 020	504, 973	106, 206	743, 442	156, 226	1, 248, 415
1920	81, 782	1, 083, 262	221, 985	1, 664, 888	303, 767	2, 748, 150
1921	47, 904	510, 177	----------	----------	47, 904	510, 177
1922	[1] 55, 790	[1] 571, 745	(1)	(1)	55, 790	571, 745
1923	73, 350	938, 600	73, 900	165, 100	147, 250	1, 103, 700
1924	67, 240	901, 700	52, 860	139, 600	120, 100	1, 041, 300
1925	64, 600	872, 100	56, 060	560, 600	120, 660	1, 432, 700

[1] Washington included with California. Bureau of Mines not at liberty to publish figures.

Magnesite imported for consumption in the United States, 1916–1925

Year	Crude		Calcined, not purified	
	Short tons	Value	Short tons	Value
1916	75, 345	$634, 447	9, 270	$204, 183
1917	30, 277	232, 105	3, 966	232, 601
1918	5, 432	103, 233	19, 049	824, 022
1919	6, 381	103, 311	9, 471	270, 721
1920	33. 550	406, 204	14, 780	373, 165
1921	51, 993	525, 452	6, 788	250, 932
1922	73, 331	976, 283	72, 265	1, 267, 622
1923	5, 182	44, 081	72, 955	1, 022, 968
1924	6	85	64, 785	1, 172, 403
1925	487	6, 382	68, 395	1, 160, 830

Exports are not separately recorded.

MAGNESIUM

Domestic metallic magnesium sold or used in the United States, 1916–1925

Year	Number of producers	Pounds	Value	Year	Number of producers	Pounds	Value
1916	4	75, 400	$311, 462	1921	1	48, 000	$86, 000
1917	5	115, 813	233, 626	1922	[1] 60, 000	[1] 89, 000	
1918	4	284, 118	615, 217	1923	2	[1] 125, 000	[1] 155, 000
1919	3	127, 465	247, 302	1924	2	[1] 128, 000	[1] 150, 000
1920	2	(2)	(2)	1925	2	245, 000	274, 400

[1] Estimate.
[2] Bureau of Mines not at liberty to publish figures.

Magnesium imported for consumption in the United States, 1918–1925

Year	Pounds	Value	Year	Pounds	Value
1918—July to December [1]	11, 899	$16, 259	1922	182, 939	$54, 448
1919	13, 239	13, 583	1923	13, 974	11, 576
1920	29, 275	25, 055	1924	8, 738	6, 561
1921	39, 913	30, 592	1925	8, 326	7, 070

[1] Prior to 1915 the entire domestic supply was imported, but such imports are not separately shown until July, 1918.

Exports are not separately recorded.

MANGANESE

Manganese and manganiferous ore (exclusive of fluxing ore) shipped from mines in the United States, 1916–1925

Year	Ore containing 35 per cent of manganese or more			Ore containing 10 to 35 per cent of manganese			Ore containing 5 to 10 per cent of manganese		
	Number of shippers	Long tons	Value	Number of shippers	Long tons	Value	Number of shippers	Long tons	Value
1916	61	31,474	$656,278	[1] 26	316,600	$1,121,172	6	81,615	$188,172
1917	174	129,351	4,109,632	70	576,608	2,777,171	5	108,409	283,271
1918	247	305,869	8,240,386	110	818,003	4,445,005	11	236,103	977,118
1919	42	54,957	1,791,118	24	211,632	965,660	9	112,303	352,570
1920	56	94,420	2,396,235	31	357,279	1,450,518	6	279,687	644,572
1921	14	13,531	495,097	6	8,439	42,755	3	62,670	147,576
1922	18	13,404	455,160	9	344,674	1,071,780	6	251,614	632,039
1923	36	31,500	874,973	41	319,666	1,158,628	12	1,072,457	3,598,327
1924	39	56,515	1,307,477	55	286,470	929,390	12	587,026	1,713,943
1925	42	98,324	1,857,769	53	267,252	915,316	11	1,153,268	2,799,403

[1] Exclusive of shippers in Colorado; number unknown.

Manganese and manganiferous ore (for fluxing purposes) shipped from mines in the United States, 1916–1925

Year	Ore containing 35 per cent of manganese or more		Ore containing 10 to 35 per cent of manganese		Ore containing 5 to 10 per cent of manganese	
	Long tons	Value	Long tons	Value	Long tons	Value
1916			137,253	$666,257	8,858	$1,029
1917	54	$90	154,151	259,121	21,776	86,498
1918			98,160	158,785	18,196	54,671
1919	365	5,745	98,202	216,868	11,596	17,394
1920			123,970	332,615	6,728	10,093
1921			22,962	[1] 57,000	3,028	[1] 7,800
1922	2,278	17,341	27,705	[1] 52,000	1,666	[1] 10,600
1923	769	(2)	40,770	[1 2] 134,133	1,004	[1] 2,510
1924	1,833	(2)	24,972	[1 2] 107,215		
1925			25,384	[1]36,177	2,150	[1]1,590

[1] Partly estimated.
[2] Value for 35 per cent ore included with that for 10–35 per cent ore. Bureau of Mines not at liberty to publish figures.

Manganese and manganiferous ore (exclusive of fluxing ore) shipped from mines in the United States, 1924 and 1925, by States

State	Ore containing 35 per cent of manganese or more			Ore containing 10 to 35 per cent of manganese			Ore containing 5 to 10 per cent of manganese		
	Number of shippers	Long tons	Value	Number of shippers	Long tons	Value	Number of shippers	Long tons	Value
1924									
Alabama	3	1,242	$24,954	9	611	$6,722			
Arizona	1	42	798						
Arkansas	6	3,400	60,350	6	7,991	37,170			
California	2	850	(1)						
Colorado	2	5,338	48,042	7	27,058	109,289	1	3,891	(1)
Georgia	8	1,093	18,304	19	14,182	73,684	6	6,353	$16,558
Michigan				1	50,556	157,184	1	39,939	(1)
Minnesota				4	159,915	439,132	3	361,527	970,351
Montana:									
Metallurgical	3	11,933	123,456						
Chemical	3	23,512	816,463						
Nevada	3	1,310	13,579	3	2,591	15,997			
New Mexico	2	775	(1)	2	23,246	(1)			
Tennessee	2	455	11,611						
Utah				2	116	1,010			
Virginia:									
Metallurgical	2	440	59,220	2	204	(1)			
Chemical	1	1,125							
Washington	1	5,000	100,000						
Wisconsin							1	175,316	606,593
Undistributed			30,700			89,202			120,441
	39	56,515	1,307,477	55	286,470	929,390	12	587,026	1,713,943
1925									
Alabama	2	938	12,544	5	298	3,087			
Arizona	3	294	5,102						
Arkansas	4	3,517	79,335	9	5,076	23,140			
California	3	869	17,525						
Colorado	1	743	5,127	5	7,352	26,565			
Georgia	8	1,649	20,281	20	28,038	133,215	5	7,349	23,397
Massachusetts	1	(1)	(1)	1	(1)	(1)			
Michigan				2	98,753	(1)			
Minnesota				3	77,665	184,121	4	741,409	1,577,301
Montana:									
Metallurgical	4	55,659	585,031						
Chemical	3	20,529	825,970						
Nevada	2	850	(1)	1	6,659	(1)			
New Mexico	2	1,588	(1)	2	40,848	153,251			
North Carolina	2	(1)	(1)						
Tennessee	1	352	8,800	1	(1)	(1)			
Utah	1	50	(1)	3	666	5,754	1	496	(1)
Virginia:									
Metallurgical	3	1,499	22,981	1	1,800	(1)			
Chemical	1	1,622	77,000						
Washington	1	8,113	(1)						
Wisconsin							1	404,014	(1)
Undistributed		52	198,073		97	386,183			1,198,705
	42	98,324	1,857,769	53	267,252	915,316	11	1,153,268	2,799,403

[1] Included under "Undistributed."

Manganiferous iron ore shipped from the Cuyuna district, Minn., 1916–1925, in long tons

Year	Ore containing 10 to 35 per cent of manganese	Ore containing 5 to 10 per cent of manganese	Year	Ore containing 10 to 35 per cent of manganese	Ore containing 5 to 10 per cent of manganese
1916	193,257	45,712	1921		56,530
1917	359,542	91,590	1922	305,093	248,560
1918	625,009	227,202	1923	253,634	499,181
1919	138,952	98,220	1924	159,915	361,527
1920	293,524	248,913	1925	77,665	741,409

Manganese ore [1] imported for consumption in the United States, 1916–1925

Year	Long tons	Value	Year	Long tons	Value
1916	569,569	$8,640,065	1922 (Jan. 1–Sept. 21	327,727	$2,695,724
1917	629,972	10,262,929	1922 (Sept. 22–Dec. 31	[2] 18,124	364,247
1918	491,303	15,095,867	1923	[2] 78,391	1,674,914
1919	333,344	11,229,184	1924	[2] 224,230	5,305,791
1920	606,937	12,230,922	1925	[2] 277,055	7,417,582
1921	401,354	3,365,732			

[1] Prior to Sept. 22, 1922, figures represent ore; beginning with new tariff, figures represent manganese content of ore.

[2] Includes estimate by the Bureau of Mines for manganese content of ore imported from Cuba. The Bureau of Foreign and Domestic Commerce records only gross weight of Cuban ore imported, and the figures for such ore have been as follows: 1922 (Sept. 22 to Dec. 31), 190 long tons; 1923, 9,062 tons; 1924, 23,065 tons; 1925, 12,745 tons.

No separate record of exports of manganese ore is kept.

MANGANIFEROUS ZINC RESIDUUM

Manganiferous zinc residuum containing 12 to 15 per cent of manganese and 40 per cent of iron is recovered from roasted franklinite concentrates at Franklin Furnace, N. J. No price is given for this material as it is not sold in the open market but is reduced to spiegeleisen by the company that produces it.

Manganiferous residuum, from zinc roasting in the United States, shipped in 1916–1925, in long tons

1916	198,817	1921	12,627
1917	155,332	1922	81,333
1918	146,796	1923	132,801
1919	80,418	1924	119,457
1920	133,602	1925	147,937

MARLS

Calcareous marl sold by producers in the United States, 1916–1925

Year	Short tons	Value	Year	Short tons	Value
1916	58,088	$144,768	1921	59,730	$195,743
1917	73,900	165,223	1922	67,777	203,196
1918	98,694	261,082	1923	99,410	328,932
1919	91,437	327,294	1924	72,710	225,383
1920	97,487	322,339	1925	68,670	187,839

Greensand marl produced in the United States, 1916–1925

Year	Short tons	Value	Year	Short tons	Value
1916	1,220	$610	1921	2,058	$10,200
1917	408	384	1922	7,885	56,800
1918	3,582	4,775	1923	10,656	131,123
1919	(1)	(1)	1924	14,055	151,205
1920	(1)	(1)	1925	12,728	179,788

[1] Bureau of Mines not at liberty to publish figures.

No imports or exports of marl are reported.

MERCURY

Mercury produced in the United States, 1916–1925

[Flasks of 75 pounds]

Year	Flasks	Value	Year	Flasks	Value
1916	29,932	$3,768,139	1921	6,339	$300,595
1917	36,159	3,808,266	1922	6,375	368,348
1918	32,883	3,863,752	1923	7,937	521,302
1919	21,415	1,933,560	1924	10,085	692,739
1920	13,392	1,066,807	1925	9,174	762,616

Mercury imported into and exported from the United States, 1916–1925

Year	Imports for consumption		Exports	
	Flasks	Value	Flasks	Value
1916	5,659	$515,919	8,880	$670,475
1917	5,207	448,032	10,778	998,470
1918	6,719	533,622	3,098	338,620
1919	10,635	791,226	9,107	817,328
1920	14,169	971,510	1,553	129,993
1921	10,601	457,993	393	18,869
1922	16,920	757,842	291	15,910
1923	18,073	816,043	318	25,195
1924	13,170	566,820	208	14,333
1925	20,855	1,200,878	204	15,930

MICA

Mica[1] sold by producers in the United States, 1916–1925

Year	Sheet mica[1]		Scrap mica		Total[1]	
	Pounds	Value	Short tons	Value	Short tons	Value
1916	865,863	$524,485	4,433	$69,906	4,866	$594,391
1917	1,276,533	753,874	3,429	52,908	4,067	806,782
1918	1,644,200	731,810	2,292	33,130	3,114	764,940
1919	1,545,709	483,567	3,258	58,084	4,031	541,651
1920	1,683,480	546,972	5,723	167,017	6,565	713,989
1921	741,845	118,513	2,577	56,849	2,948	175,362
1922	1,077,968	194,301	[2] 6,641	114,045	[2] 7,180	308,346
1923	2,063,179	311,180	[2] 8,054	129,695	[2] 9,086	440,875
1924	1,460,897	212,035	4,709	87,242	5,439	299,277
1925	1,793,865	321,962	9,695	173,537	10,592	495,499

[1] For 1920 and later years the figures for sheet mica represent uncut sheet exclusively; for earlier years some cut sheet was included.
[2] Includes mica derived from mica schist.

Mica imported for consumption in the United States, 1916–1925

Year	Sheet				Ground		Total	
	Unmanufactured		Cut and splittings					
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
1916	703,832	$421,856	(1)	$646,080	362,000	$3,420	(1)	$1,071,356
1917	656,391	414,823	(1)	1,014,181	92,963	1,044	(1)	1,430,048
1918	741,429	658,576	(1)	880,906	11,587	1,647	(1)	1,541,129
1919	723,713	726,532	(1)	762,228	62	9	(1)	1,488,769
1920	1,298,537	1,177,943	(1)	2,011,434			(1)	3,189,377
1921	328,444	331,219	(1)	758,521	134,650	2,166	(1)	1,091,906
1922	385,653	359,793	(1)	[2] 966,315	313,745	4,514	(1)	1,330,622
1923	1,044,366	532,375	[3] 4,419,102	[3] 1,844,149	1,867,385	28,324	7,330,853	2,404,848
1924	671,793	419,154	[3] 3,787,251	[3] 1,885,718	1,342,107	22,034	5,801,151	2,326,906
1925	604,550	526,292	[3] 3,346,144	[3] 1,259,415	950,614	13,120	4,901,308	1,798,827

[1] Quantity not reported.
[2] Includes also value of "built up, washers, and other manufactures" ($20,899) imported Sept. 22 to Dec. 31. Not separately classified prior to new tariff.
[3] Composed of following: 1923, "Cut mica" 60,135 pounds, $49,268; "splittings" 4,301,727 pounds, $1,730,532; "built up" 30,032 pounds, $37,382; and "washers and other" 27,208 pounds, $26,967; 1924, "Cut mica" 74,534 pounds, $69,018; "splittings" 3,619,229 pounds, $1,681,774; "built up" 18,205 pounds, $41,455; and "washers and other" 75,283 pounds, $93,471; 1925, "Cut mica" 41,284 pounds, $63,466; "splittings" 3,239,554 pounds, $1,113,202; "built up" 14,639 pounds, $16,785; and "washers and other" 50,667 pounds, $65,962.

Value of mica exported from the United States, 1916–1925

1916	$78,671	1921	$153,990
1917	74,485	1922	129,186
1918	74,529	1923	182,162
1919	109,348	1924	169,741
1920	316,169	1925	198,596

MILLSTONES

[See Abrasive materials]

MINERAL PAINTS

Domestic zinc and lead pigments,[1] made directly from ores in the United States, sold by producers, 1916–1925

Year	Short tons	Value	Year	Short tons	Value
1916	135,606	$23,515,803	1921	102,463	$14,801,032
1917	140,636	26,972,137	1922	162,815	22,205,400
1918	135,746	26,464,590	1923	163,240	23,660,381
1919	155,648	25,810,671	1924	173,859	25,711,159
1920	143,244	24,564,572	1925	199,190	28,310,631

[1] Include sublimed blue lead, sublimed white lead, leaded zinc oxide, and zinc oxide.

The canvass of natural mineral pigments was discontinued after 1915. Iron ore sold for paint, 1916 to 1925, is shown below.

Iron ore sold for paint, by producers, in the United States, 1916–1925

Year	Short tons	Value	Year	Short tons	Value
1916	19,004	$45,256	1921	11,624	$56,824
1917	20,895	56,859	1922	30,668	166,682
1918	10,034	22,924	1923	27,823	140,306
1919	17,885	84,630	1924	23,106	103,626
1920	27,382	112,364	1925	29,704	140,986

MINERAL WATERS

Natural mineral waters sold by producers in the United States, 1916–1923[1]

Year	Gallons	Value	Year	Gallons	Value
1916	55,928,461	$5,735,035	1920	36,218,260	$4,860,915
1917	46,784,419	4,931,710	1921	34,781,238	4,876,445
1918	40,709,722	4,533,001	1922	38,492,881	5,498,269
1919	38,697,280	4,880,186	1923	44,430,998	6,493,177

[1] Canvass discontinued after 1923.

Mineral waters (natural and artificial) imported for consumption in the United States, 1916–1925

Year	Gallons	Value	Year	Gallons	Value
1916	1,553,199	$624,302	1921	524,765	$167,101
1917	618,405	268,665	1922	698,751	269,245
1918	489,487	241,641	1923	722,657	279,875
1919	203,014	116,948	1924	758,771	323,908
1920	527,114	203,901	1925	794,593	355,411

Large quantities of a few domestic waters are exported, but no figures are available prior to 1922. Exports of natural and artificial mineral waters have been as follows: 1922, 209,219 gallons, valued at $169,473; 1923, 227,831 gallons, $193,248; 1924, 221,203 gallons, $179,418; 1925, 206,754 gallons, $178,828.

MOLYBDENUM

Molybdenum in ore and concentrates, produced in the United States, sold in 1916–1925

Year	Pounds	Value	Year	Pounds	Value
1916	206,746	$205,000	1921		
1917	350,200	495,350	1922		
1918	861,637	1,253,700	1923	22,667	(1)
1919	297,926	341,814	1924	297,174	(1)
1920	34,900	17,207	1925	1,154,650	[2] $450,080

[1] Value not reported.

[2] Estimate by Bureau of Mines.

"Molybdenum ore[1] *(steel-hardening)" imported for consumption in the United States, 1918–1925*

Year	Pounds	Value	Year	Pounds	Value
1918—July to December [2]	[3] 140,222	$123,924	1922	[3] 412,221	$90,015
1919	[3] 106,743	77,572	1923	[4] 16,671	13,115
1920	[3] 15,639	9,707	1924	[4] 10,379	9,038
1921	[3] 29,783	20,471	1925	[4] 1,954	1,793

[1] Prior to Sept. 22, 1922, imports recorded as ore; beginning with new tariff, recorded as molybdenum content of ore.
[2] Not separately classified prior to July, 1918.
[3] Recorded as molybdenum ore.
[4] Recorded as molybdenum content of ore.

For imports of ferromolybdenum, see under Ferro-alloys. Exports of ferromolybdenum are not separately classified.

NICKEL

Nickel content of nickel salts and metallic nickel produced in the United States as a by-product in the electrolytic refining of copper, 1916–1925, and from mixed ores in 1919 and 1920

Year	Short tons	Value	Year	Short tons	Value
1916	918	$671,192	1921	111	$86,000
1917	402	331,556	1922	208	133,191
1918	441	401,000	1923	100	71,605
1919 [1]	511	434,485	1924	191	114,903
1920 [1]	365	293,250	1925	272	169,664

[1] Including nickel produced from copper-lead-cobalt-nickel ores mined in Missouri.

Secondary nickel recovered as metal and in nonferrous alloys and salts in the United States, 1916–1925

Year	Short tons	Value	Year	Short tons	Value
1916	[1] 816	$652,800	1921	945	$680,400
1917	[1] 860	774,000	1922	1,512	967,700
1918	1,393	1,532,300	1923	1,550	1,109,800
1919	2,447	1,829,400	1924	2,240	1,227,500
1920	2,200	1,733,600	1925	2,300	1,518,000

[1] Exclusive of recoveries by International Nickel Co. from scrap nickel or alloys.

Nickel imported for consumption in the United States, 1916–1925

Year	Nickel, nickel ore and matte, nickel oxide, and alloys of nickel with copper, etc.		Manufactures and nickel sheets and strips	Total value
	Pounds	Value		
1916	72,649,377	$9,899,340	$25,880	$9,925,220
1917	75,526,767	9,617,163	45,248	9,662,411
1918	73,207,147	11,520,826	115,243	11,636,069
1919	36,565,462	8,334,564	90,451	8,425,015
1920	48,492,270	10,657,523	200,464	10,857,987
1921	4,400,453	1,220,347	107,155	1,327,502
1922	14,919,408	3,945,309	110,176	4,055,485
1923	40,670,189	6,602,096	94,832	6,696,928
1924	36,918,980	6,152,984	70,755	6,203,739
1925	43,071,073	7,772,320	98,761	7,871,081

Nickel imported for consumption in the United States, 1924 and 1925, by classes

Class	1924		1925	
	Pounds	Value	Pounds	Value
Unmanufactured:				
Nickel ore and matte (nickel content)	11,333,251	$1,063,084	9,912,145	$1,062,844
Nickel alloys, pigs, bars, etc	24,683,882	4,949,655	31,876,710	6,532,495
Nickel oxide	901,847	120,245	1,282,218	176,981
Manufactured:				
Nickel or German silver in sheets, strips, and rods	20,113	4,548	7,565	4,369
All other manufactures of nickel	145,785	66,207	123,681	94,392
	37,084,878	6,203,739	43,202,319	7,871,081

Nickel, nickel oxide, and matte [1] exported from the United States, 1916–1925

Year	Pounds	Value	Year	Pounds	Value
1916	33,404,011	$12,952,493	1921	425,851	$103,372
1917	21,992,820	8,936,620	1922	9,317,520	1,016,091
1918	17,469,500	6,927,041	1923 [1]	11,200	626
1919	3,810,656	1,697,544	1924 [1]		
1920	1,215,232	574,845	1925 [1]		

[1] Nickel oxide and matte only after 1922. Separate figures for nickel not available. See following table.

Nickel exported from the United States, 1924 and 1925, by classes

Class	1924		1925	
	Pounds	Value	Pounds	Value
Nickel	1,915,456	$565,911	2,569,185	$834,529
Monel metal and other alloys				
Manufactures	446,183	203,854	529,906	360,628
Nickel or German silver in bars, rods, or sheets	250,769	73,372	492,964	135,906

OILSTONES AND SCYTHESTONES

[See Abrasive materials]

ORE

Crude metallic ores (including tailings, etc.) shipped from or treated at the mine in the United States, 1920–1925, in short tons

[Figures rounded]

Class of ore	1920	1921	1922	1923	1924	1925
Aluminum ore (bauxite)	584,000	156,000	347,000	585,000	389,000	355,000
Chromite	3,000	300	400	250	320	120
Dry and siliceous (gold and silver) ore	8,590,000	8,436,000	8,728,000	9,122,000	8,979,000	8,995,000
Iron ore[1]	77,539,000	29,750,000	56,641,000	78,092,000	58,298,000	71,557,000
Manganese ore (35 per cent or more Mn)[1]	106,000	15,000	15,000	35,000	63,000	110,000
Manganiferous ore (5 to 35 per cent Mn)[1]	713,000	80,000	668,000	1,559,000	978,000	1,591,000
Mercury ore	109,000	35,000	43,000	51,000	70,000	65,000
Copper ore:						
Western States	30,236,000	9,221,000	21,383,000	39,433,000	43,344,000	45,430,000
Central States	5,939,000	3,611,000	4,952,000	5,363,000	5,373,000	7,037,000
Eastern States	590,000	564,000	558,000	777,000	715,000	795,000
	36,765,000	13,396,000	26,893,000	45,573,000	49,432,000	53,262,000
Copper-lead and copper-lead-zinc ore	27,000	14,000	52,000	162,000	220,000	229,000
Lead ore:						
Western States	2,368,000	2,054,000	2,124,000	2,288,000	2,359,000	2,271,000
Central States	4,822,000	5,075,000	5,162,000	5,320,000	6,205,000	6,287,000
Eastern States	10,000		2,000	5,500	5,000	2,000
	7,200,000	7,129,000	7,288,000	7,613,000	8,569,000	8,560,000
Lead-zinc ore:						
Western States	1,444,000	122,000	445,000	1,204,000	1,792,000	2,704,000
Central States	10,939,000	3,614,000	8,110,000	9,783,000	11,493,000	14,917,000
Eastern States					71,000	120,000
	12,383,000	3,736,000	8,555,000	10,987,000	13,356,000	17,741,000
Zinc ore:						
Western States	482,000	10,000	471,000	724,000	146,000	169,000
Central States	1,058,000	933,000	1,206,000	2,154,000	1,639,000	1,674,000
Eastern States	1,111,000	765,000	990,000	1,186,000	1,375,000	1,568,000
	2,651,000	1,708,000	2,667,000	4,064,000	3,160,000	3,411,000
Grand total	146,670,000	64,455,000	111,897,000	157,843,000	143,514,000	165,876,000

[1] Exclusive of fluxing ore.

PEAT

Peat produced in the United States, 1916–1925

Year	Short tons	Value	Year	Short tons	Value
1916	52,506	$369,104	1921	30,406	$260,119
1917	97,363	709,900	1922	60,680	397,729
1918	107,261	1,047,243	1923	61,355	376,834
1919	69,197	705,532	1924	55,469	395,470
1920	73,204	921,732	1925	72,436	452,898

Peat moss imported for consumption in the United States, 1916–1925

Year	Short tons	Value	Year	Short tons	Value
1916	3,042	$27,859	1921	3,450	$22,754
1917	506	4,966	1922	4,805	33,034
1918			1923	5,973	43,184
1919	464	16,345	1924	5,541	47,208
1920	2,762	36,201	1925	10,233	121,719

PETROLEUM AND PETROLEUM PRODUCTS

CRUDE PETROLEUM

Crude petroleum produced in the United States, 1916–1925

[Barrels of 42 United States gallons]

Year	Barrels	Value at wells	Year	Barrels	Value at wells
1916	300,767,000	$330,900,000	1921	472,183,000	$814,745,000
1917	335,316,000	522,635,000	1922	557,531,000	895,111,000
1918	355,928,000	703,944,000	1923	732,407,000	978,430,000
1919	378,367,000	760,266,000	1924	713,940,000	1,022,683,000
1920	442,929,000	1,360,745,000	1925	763,743,000	1,284,960,000

Crude petroleum produced in the United States, 1923–1925, by fields and States

	1923		1924		1925	
	Barrels	Value at wells	Barrels	Value at wells	Barrels	Value at wells
FIELD						
Appalachian	28,225,000	$78,886,000	27,056,000	$80,855,000	27,610,000	$85,440,000
Lima-Indiana	2,404,000	4,820,000	2,287,000	4,550,000	2,120,000	4,580,000
Illinois and southwest Indiana	9,500,000	17,690,000	8,747,000	15,420,000	8,512,000	16,480,000
Mid-Continent	348,460,000	535,060,000	375,479,000	549,570,000	424,331,000	732,930,000
Gulf coast	33,271,000	46,120,000	28,569,000	44,620,000	33,112,000	53,360,000
Rocky Mountain [1]	47,653,000	53,082,000	42,869,000	53,015,000	35,554,000	61,516,000
California	262,876,000	242,731,000	228,933,000	274,653,000	232,492,000	330,610,000
Other fields [2]	18,000	41,000			12,000	44,000
	732,407,000	978,430,000	713,940,000	1,022,683,000	763,743,000	1,284,960,000
STATE						
Alaska	(3)	(3)	(3)	(3)	8,000	34,000
Arkansas	36,610,000	25,400,000	46,028,000	43,130,000	77,398,000	68,880,000
California	262,876,000	242,731,000	228,933,000	274,653,000	232,492,000	330,610,000
Colorado	86,000	102,000	445,000	490,000	1,226,000	1,810,000
Illinois	8,707,000	16,250,000	8,081,000	14,220,000	7,863,000	15,235,000
Indiana	1,043,000	1,900,000	935,000	1,720,000	829,000	1,615,000
Kansas	28,250,000	45,970,000	28,836,000	44,400,000	38,357,000	74,410,000
Kentucky	8,059,000	15,900,000	7,407,000	14,592,000	6,759,000	15,682,000
Louisiana	24,919,000	36,530,000	21,124,000	30,340,000	20,272,000	32,500,000
Michigan					4,000	10,000
Montana	2,782,000	4,680,000	2,815,000	3,754,000	4,091,000	6,420,000
New Mexico	(3)	(3)	98,000	127,000	1,060,000	1,815,000
New York	1,250,000	4,140,000	1,440,000	5,245,000	1,695,000	6,270,000
Ohio	7,085,000	17,050,000	6,811,000	17,165,000	7,212,000	18,280,000
Oklahoma	160,929,000	279,700,000	173,538,000	272,450,000	176,768,000	348,230,000
Pennsylvania	7,609,000	25,320,000	7,486,000	27,025,000	8,097,000	29,310,000
Tennessee	8,000	14,000	10,000	18,000	24,000	53,000
Texas	131,023,000	193,580,000	134,522,000	203,870,000	144,648,000	262,270,000
Utah			(3)	(3)	4,000	4,000
West Virginia	6,358,000	20,822,000	5,920,000	20,840,000	5,763,000	20,055,000
Wyoming	44,785,000	48,900,000	39,498,000	48,600,000	29,173,000	51,467,000
Undistributed [4]	18,000	41,000	13,000	44,000		
	732,407,000	978,430,000	713,940,000	1,022,683,000	763,743,000	1,284,960,000

[1] Production of Alaska included with Rocky Mountain for 1924.
[2] 1923: Alaska, Missouri, and New Mexico; 1925: Alaska and Michigan.
[3] Included under "Undistributed."
[4] 1923: Alaska, Missouri, and New Mexico; 1924: Alaska and Utah.

Stocks of crude petroleum held in the United States on December 31, 1924 and 1925, in barrels

		1924	1925
East of California:			
At refineries, by location of storage—			
East coast—			
Domestic		8,230,000	4,801,000
Foreign		1,462,000	2,650,000
Appalachian		1,306,000	1,507,000
Indiana, Illinois, etc		1,762,000	1,318,000
Oklahoma, Kansas, etc		5,458,000	3,422,000
Texas—			
Inland		1,310,000	944,000
Gulf coast—			
Domestic		4,837,000	5,616,000
Foreign		358,000	341,000
Arkansas and inland Louisiana		267,000	656,000
Louisiana—Gulf coast—			
Domestic		3,763,000	3,242,000
Foreign		1,474,000	1,197,000
Rocky Mountain		957,000	1,463,000
Total at refineries		31,184,000	27,157,000
Pipe-line and tank-farm stocks—			
Domestic petroleum, by fields of origin—			
Appalachian—			
New York, Pennsylvania, West Virginia, eastern and central Ohio	gross	7,261,000	7,047,000
	net	7,020,000	6,745,000
Kentucky	gross	2,388,000	1,854,000
	net	2,266,000	1,748,000
Lima-Indiana	gross	1,431,000	1,173,000
	net	1,221,000	971,000
Illinois-southwestern Indiana	gross	11,401,000	11,056,000
	net	10,870,000	10,582,000
Mid-Continent—			
Oklahoma, Kansas, north, central, and western Texas	gross	187,884,000	165,244,000
	net	176,754,000	153,012,000
North Louisiana and Arkansas	gross	36,047,000	45,186,000
	net	33,804,000	42,929,000
Gulf coast	gross	20,565,000	19,624,000
	net	20,200,000	19,263,000
Rocky Mountain	gross	28,711,000	29,040,000
	net	28,672,000	28,995,000
Total pipe-line and tank-farm	gross	295,688,000	280,224,000
	net	280,807,000	264,245,000
Foreign crude petroleum held in United States by importers—			
At Atlantic coast stations		199,000	104,000
At Gulf coast stations		535,000	303,000
Total		734,000	407,000
Producers' stocks		8,389,000	7,560,000
Total crude stocks east of California		321,114,000	299,369,000
California:			
Light		40,541,000	44,451,000
Heavy (including fuel oil)		55,964,000	84,983,000

Indicated deliveries of crude petroleum (exclusive of California grades) to consumers in the United States, 1924 and 1925, in barrels [1]

	1924	1925
Domestic petroleum, by fields of origin:		
Appalachian	26, 991, 000	28, 397, 000
Lima-Indiana	2, 044, 000	2, 374, 000
Illinois and southwestern Indiana	8, 967, 000	8, 811, 000
Mid-Continent	368, 686, 000	439, 742, 000
Gulf coast	32, 709, 000	34, 004, 000
Rocky Mountain	[2] 34, 122, 000	35, 302, 000
Other [3]	(2)	12, 000
Deliveries and exports	473, 519, 000	548, 642, 000
Exports	10, 963, 000	10, 153, 000
Deliveries	462, 556, 000	538, 489, 000
Foreign petroleum	78, 056, 000	61, 941, 000
	540, 612, 000	600, 430, 000

[1] Indicated deliveries equal production plus imports plus stocks, exclusive of refinery stocks, at beginning of period minus exports and stocks at end of period.
[2] Alaska included with Rocky Mountain for 1924.
[3] 1924: Alaska; 1925: Alaska and Michigan.

Crude petroleum imported into and exported from the United States, 1916–1925

Year	Imports for consumption		Exports			
			Domestic petroleum		Foreign petroleum [1]	
	Barrels	Value	Barrels	Value	Barrels	Value
1916	20, 570, 075	$12, 602, 811	4, 095, 902	$7, 029, 923	(2)	(2)
1917	30, 162, 583	16, 400, 017	4, 098, 124	7, 668, 312	40, 185	$60, 331
1918	37, 735, 641	21, 319, 464	4, 900, 691	12, 084, 250	32	201
1919	52, 821, 567	26, 442, 881	5, 924, 320	14, 805, 546	94, 331	42, 520
1920	106, 175, 289	55, 799, 254	8, 044, 907	28, 990, 444	712, 185	990, 430
1921	125, 363, 983	66, 547, 379	8, 865, 497	20, 204, 491	74, 136	57, 407
1922	127, 308, 423	70, 383, 309	9, 995, 093	18, 348, 110	167, 724	74, 121
1923	82, 015, 025	53, 882, 259	17, 060, 771	23, 111, 832	324, 607	150, 358
1924	77, 775, 173	73, 841, 507	17, 604, 877	26, 495, 011	367, 662	165, 401
1925	61, 824, 242	75, 406, 956	13, 125, 157	24, 274, 905	209, 950	94, 372

[1] Exports of refined products and shipments of crude petroleum to Alaska, Hawaii, Porto Rico, and the Philippine Islands are not included.
[2] Not separately recorded.

PETROLEUM PRODUCTS

Crude petroleum run to stills and chief petroleum products produced at refineries in the United States, 1916–1925, in barrels

Year	Crude petroleum run to stills		Chief petroleum products			
	Domestic	Foreign	Gasoline	Kerosene	Gas and fuel oils	Lubricants
1916	246, 992, 000		49, 021, 000	34, 655, 000	111, 045, 000	14, 870, 000
1917	315, 132, 000		67, 870, 000	41, 114, 000	155, 079, 000	17, 947, 000
1918	326, 025, 000		85, 007, 000	43, 461, 000	174, 319, 000	20, 035, 000
1919	361, 520, 000		94, 235, 000	55, 753, 000	181, 602, 000	20, 161, 000
1920	433, 915, 000		116, 251, 000	55, 240, 000	210, 987, 000	24, 938, 000
1921	443, 363, 000		122, 704, 000	46, 313, 000	230, 091, 000	20, 896, 000
1922	425, 823, 000	74, 883, 000	147, 672, 000	54, 913, 000	254, 910, 000	23, 304, 000
1923	538, 252, 000	42, 986, 000	179, 903, 000	55, 927, 000	287, 481, 000	26, 128, 000
1924	597, 954, 000	45, 765, 000	213, 326, 000	60, 026, 000	320, 476, 000	27, 498, 000
1925	698, 582, 000	41, 338, 000	259, 601, 000	59, 689, 000	364, 991, 000	31, 055, 000

Chief petroleum products imported for consumption in the United States, 1916–1925, in barrels

Year	Gasoline	Kerosene	Gas and fuel oils	Lubricants
1916	64,366	[1]	[1]	[1]
1917	249,872	[1]	[1]	[1]
1918	307,127	[1]	[1]	[1]
1919	202,861	[1]	[1]	[1]
1920	963,764	[1]	[1]	[1]
1921	900,381	[1]	[1]	[1]
1922	1,479,349	[2] 3,487	[2] 2,947,102	[2] 43,057
1923	4,555,084	7,178	12,286,260	29,027
1924	3,452,923	9,942	12,926,837	10,761
1925	3,812,790	19,281	12,245,468	37,475

[1] Not separately classified prior to Sept. 22, 1922.
[2] Figures cover Sept. 22 to Dec. 31, 1922; not separately classified prior to new tariff.

Chief petroleum products exported from the United States, 1916–1925, in barrels

Year	Gasoline	Kerosene	Gas and fuel oils	Lubricants
1916	8,473,102	20,349,724	22,800,054	6,209,665
1917	9,901,877	15,670,392	26,749,358	6,677,087
1918	13,318,306	11,693,091	28,589,293	6,126,601
1919	8,860,309	23,313,218	13,924,991	6,542,742
1920	15,269,280	20,730,120	19,704,625	9,574,320
1921	12,692,270	17,832,693	20,120,493	6,888,491
1922	13,787,191	21,315,015	16,600,462	7,889,516
1923	20,135,567	20,188,796	29,252,245	8,295,726
1924	28,246,078	21,817,890	34,292,709	9,030,944
1925	30,637,804	21,074,667	32,508,547	9,596,484

PHOSPHATE ROCK

Phosphate rock sold or used by producers in the United States, 1916–1925

Year	Long tons	Value	Year	Long tons	Value
1916	1,982,385	$5,896,993	1921	2,064,025	$12,270,070
1917	2,584,287	7,771,084	1922	2,417,883	10,482,846
1918	2,490,760	8,214,463	1923	3,006,706	11,576,049
1919	2,271,983	11,591,268	1924	2,867,789	10,252,083
1920	4,103,982	25,079,572	1925	3,481,819	11,545,678

Phosphate rock imported into and exported from the United States, 1916–1925

Year	Imports for consumption		Exports	
	Long tons	Value	Long tons	Value
1916	4,612	$36,389	243,678	$1,156,391
1917	92	1,169	166,358	835,045
1918			143,455	912,485
1919	34	457	378,731	3,567,982
1920	63	2,090	1,069,712	10,570,175
1921	3,535	43,960	733,312	7,320,137
1922	5,890	95,846	719,294	5,858,167
1923	6,725	92,263	827,551	5,772,171
1924	16,098	181,515	818,773	5,120,832
1925	2,735	37,932	870,200	5,677,763

PLATINUM AND ALLIED METALS

Reports received from refiners of crude platinum, gold bullion, and copper indicate that 49,643 troy ounces of refined new metals of the platinum group were recovered in 1925, of which about 11,209 ounces are believed to be of domestic origin.

New platinum and allied metals recovered by refiners in the United States, 1916–1925, in troy ounces

Year	Platinum	Palladium	Iridium	Osmiridium	Other	Total
1916	24,518	2,885	370	315	----------	28,088
1917	33,009	4,779	210	833	----------	38,831
1918	54,399	4,024	465	539	326	59,753
1919	40,220	3,807	401	402	279	45,109
1920	36,015	4,309	418	409	393	41,544
1921	51,791	2,686	286	581	1,026	56,370
1922	54,142	1,943	210	1,301	122	57,718
1923	46,780	1,934	280	787	16	49,797
1924	57,827	6,065	680	1,261	174	66,007
1925	41,300	7,358	283	648	54	49,643

Dealers and refiners reported recovery in 1925 of 43,274 ounces of secondary platinum metals derived from refining scrap and sweeps. The figures that make up this total probably represent some duplication, as the same metal may be handled as scrap several times in a year.

Secondary platinum and allied metals recovered in the United States, 1916–1925, in troy ounces

Year	Platinum	Palladium	Iridium	Other	Total
1916	45,156	1,284	1,535	----------	47,975
1917	59,007	3,347	9,832	----------	72,186
1918	40,378	1,795	3,410	----------	45,583
1919	54,545	3,467	3,504	----------	61,516
1920	51,255	3,100	3,355	----------	57,710
1921	39,131	4,887	1,776	229	46,023
1922	40,062	4,193	1,937	496	46,688
1923	39,152	6,246	2,021	453	47,872
1924	45,474	5,784	2,200	1,013	54,471
1925	35,578	4,680	1,827	1,189	43,274

Platinum and allied metals imported for consumption in the United States, 1916–1925

Year	Troy ounces	Value	Year	Troy ounces	Value
1916	63,795	$3,710,815	1921	78,378	$5,418,464
1917	35,773	2,957,197	1922	110,025	8,983,547
1918	56,756	5,167,908	1923	106,637	10,466,705
1919	68,054	6,747,447	1924	111,359	11,030,349
1920	100,546	10,617,440	1925	125,802	13,230,148

Platinum and allied metals imported for consumption in the United States, 1924 and 1925, by metals

Metal	1924		1925	
	Troy ounces	Value	Troy ounces	Value
Platinum:				
Ores of platinum metals (platinum content)	1,890	$207,905	757	$71,386
Grains, nuggets, sponge, or scrap	61,952	5,937,792	58,718	5,725,015
Ingots, bars, sheets or plates, not less than one-eighth inch thick	31,871	3,678,416	47,002	5,504,068
	95,713	9,824,113	106,477	11,300,469
Manufactures of, except jewelry	17	2,367	62	6,991
Iridium	1,397	214,384	2,349	586,913
Osmiridium	1,446	174,460	3,236	446,276
Osmium	350	38,931	1,050	120,845
Palladium	10,388	624,478	8,296	483,349
Rhodium	1,166	105,770	2,476	169,687
Ruthenium	882	45,846	1,856	115,618
	111,359	11,030,349	125,802	13,230,148

Platinum exported from the United States, 1916–1925

Year	Unmanufactured		Manufactures of, except jewelry	
	Troy ounces	Value	Troy ounces	Value
1916	1,145	$97,988	(1)	$83,864
1917	3,445	234,433	(1)	65,415
1918	119	13,511	(1)	23,562
1919	522	75,066	(1)	54,529
1920	1,302	177,115	(1)	111,014
1921	3,272	244,473	741	85,216
1922 Crude, scrap, and old	143	13,149	486	35,967
1922 Ingots, sheets, wire, and alloys	1,313	127,047		
1923	1,151	128,599	592	65,073
1924	5,854	643,282	1,274	136,948
1925	16,234	1,787,122	3,537	249,975

[1] Quantity not recorded

POTASH

Potash produced and sold in the United States, 1916–1925

Year	Produced			Sold[1]		
	Number of plants	Crude potash (short tons)	Available content of potash (K_2O) (short tons)	Crude potash (short tons)	Available content of potash (K_2O) (short tons)	Value f. o. b. plant
1916	70	35,739	9,720	35,739	9,720	$4,242,730
1917	95	126,961	32,573	126,961	32,573	13,980,577
1918	128	207,686	54,803	140,343	38,580	15,839,618
1919	102	116,634	32,474	166,063	45,728	11,271,269
1920	66	166,834	48,077	139,963	41,444	7,463,026
1921	20	25,485	10,171	10,337	4,408	447,859
1922	12	25,176	11,714	22,028	11,313	463,512
1923	12	39,029	20,215	35,164	19,281	784,671
1924	12	43,734	22,903	37,492	21,880	842,618
1925	9	51,565	25,448	52,823	25,802	1,204,024

[1] Production and sales were practically the same in 1916 and 1917, and no distinction was made between them.

Potash materials imported for consumption in the United States, 1916–1925

Year	Potash salts used mainly in the fertilizer industry [1]			Potash salts used mainly in chemical industries [2]			Total		
	Short tons		Value	Short tons		Value	Short tons		Value
	Gross weight	Potash (K_2O) content		Gross weight	Potash (K_2O) content		Gross weight	Potash (K_2O) content	
1916	4,273	1,726	$453,091	22,369	6,159	$6,972,307	26,642	7,885	$7,425,398
1917	1,165	504	189,159	24,122	7,596	7,599,247	25,287	8,100	7,788,406
1918	525	261	117,438	23,894	7,696	8,790,398	24,419	7,957	8,907,836
1919	127,416	28,484	4,163,739	33,430	11,135	6,028,077	160,846	39,619	10,191,816
1920	918,698	197,795	33,885,627	65,564	26,997	9,504,156	982,262	224,792	43,389,783
1921	212,752	64,126	7,743,364	32,453	14,572	3,739,090	245,205	78,698	11,482,454
1922	632,711	186,264	10,951,197	34,198	15,151	4,415,891	666,909	201,415	15,367,088
1923	712,701	194,210	10,633,475	35,824	15,740	4,771,097	748,525	209,950	15,404,572
1924	663,914	187,079	10,042,575	28,336	13,286	3,325,552	692,250	200,365	13,368,127
1925	892,684	239,167	12,730,019	44,429	19,050	4,641,747	937,113	258,217	17,371,766

[1] Includes kainite, manure salts, muriate, and sulphate. Considerable quantities of muriate and some sulphate were used in chemical industries.

[2] Includes bicarbonate, bichromate, bitartrate, bromide, carbonate, caustic, chlorate, chromate, cyanide, ferricyanide, ferrocyanide, iodide, nitrate, perchlorate, permanganate, and Rochelle salt.

Domestic potash salts exported from the United States, 1917–1925

Year	Short tons		Value	Year	Short tons		Value
	Gross weight	Potash (K_2O) content			Gross weight	Potash (K_2O) content	
1917 [1]	(3)	(3)	$1,114,202	1922	6,238	2,639	$780,996
1918	(3)	(3)	1,372,170	1923	3,997	1,557	505,837
1919	(3)	(3)	2,755,544	1924	1,923	759	301,036
1920	(3)	(3)	3,562,015	1925	2,155	920	398,740
1921	(3)	(3)	335,993				

[1] Figures cover six months, July to December. Exports not separately recorded for 1916 and first six months of 1917.

[3] Figures not available.

PUMICE

[See Abrasive materials]

PYRITES

Pyrites produced in the United States, 1916–1925

Year	Long tons	Value	Year	Long tons	Value
1916	439,132	$2,038,002	1921	157,118	$711,432
1917	482,662	2,593,035	1922	169,043	671,241
1918	464,494	2,644,515	1923	181,628	661,000
1919	420,647	2,558,172	1924	160,096	645,262
1920	310,777	1,596,961	1925	170,081	650,448

Pyrites containing more than 25 per cent of sulphur imported for consumption in the United States, 1916–1925

Year	Long tons	Value	Year	Long tons	Value
1916	1,244,662	$6,728,318	1921	216,229	$818,852
1917	967,340	5,981,457	1922	279,445	1,199,076
1918	496,792	2,741,676	1923	263,695	1,254,389
1919	388,973	2,176,565	1924	246,737	598,544
1920	332,606	1,660,832	1925	276,385	773,925

Exports of "pyrites or other sulphur ore" in 1922 amounted to 323 long tons, valued at $4,325. Data for other years are not separately shown.

QUARTZ

[See under Silica]

QUICKSILVER

[See Mercury]

RADIUM

[See Uranium and vanadium ores]

SALT

Salt sold or used by producers in the United States, 1916–1925

Year	Short tons				Total value
	Manufactured (evaporated)	In brine	Rock salt	Total	
1916	2,454,836	2,539,717	1,368,353	6,362,906	$13,645,947
1917	2,482,564	2,890,588	1,605,025	6,978,177	19,940,442
1918	2,724,203	2,830,600	1,683,941	7,238,744	26,940,361
1919	2,392,290	2,850,639	1,639,973	6,882,902	27,074,694
1920	2,409,924	2,819,916	1,610,189	6,840,029	29,894,075
1921	1,931,243	1,577,335	1,472,576	4,981,154	24,557,966
1922	2,276,683	2,569,042	1,947,124	6,792,849	27,464,838
1923	2,239,872	2,787,239	2,103,602	7,130,713	27,795,941
1924	2,224,555	2,513,853	2,064,707	6,803,115	25,747,048
1925	2,235,170	2,819,690	2,342,640	7,397,500	26,162,361

Salt sold or used by producers in the United States, 1924 and 1925, by States

State	1924		1925	
	Short tons	Value	Short tons	Value
California	268,112	$1,361,166	292,480	$1,420,924
Idaho	33	350	(1)	(1)
Kansas	794,303	2,781,217	812,540	2,494,423
Louisiana	383,104	2,182,797	500,350	2,218,265
Michigan	1,918,463	7,864,838	2,172,600	7,710,331
New Mexico	1,700	17,000	(1)	(1)
New York	1,972,808	6,739,597	2,053,970	7,133,244
Ohio	1,102,214	3,641,585	1,173,590	4,116,625
Porto Rico	14,466	29,932	12,060	28,751
Utah	78,577	463,143	88,150	432,846
West Virginia	37,561	258,089	25,870	180,053
Undistributed [2]	231,774	407,334	265,890	426,899
	6,803,115	25,747,048	7,397,500	26,162,361

[1] Included under "Undistributed."
[2] 1924: Texas and Virginia; 1925: Idaho, Nevada, New Mexico, Texas, and Virginia.

Salt imported into and exported from the United States, 1916–1925

Year	Imports for consumption		Exports	
	Short tons	Value	Short tons	Value
1916	122,079	$342,588	84,065	$567,441
1917	64,922	280,135	113,993	1,000,773
1918	40,290	281,468	136,783	1,677,577
1919	59,514	242,704	119,416	1,396,625
1920	137,654	676,499	139,272	1,901,593
1921	93,095	531,031	109,563	1,415,471
1922	113,922	522,338	134,989	1,429,172
1923	88,750	383,258	125,529	1,211,226
1924	88,938	324,092	144,945	1,288,376
1925	85,788	316,827	155,079	1,219,935

SAND AND GRAVEL

Sand and gravel sold or used by producers in the United States, 1916–1925

Year	Glass sand		Molding sand		Building sand	
	Short tons	Value	Short tons	Value	Short tons	Value
1916	2,018,317	$1,957,797	4,662,649	$3,219,839	27,193,462	$8,569,675
1917	1,942,675	2,685,014	4,660,968	4,303,809	25,374,987	9,837,688
1918	2,172,887	4,209,728	4,910,178	5,121,865	19,686,885	9,772,556
1919	1,827,409	3,593,371	3,774,612	4,153,990	21,969,736	12,296,664
1920	2,165,926	4,748,690	5,128,075	7,504,759	26,539,365	17,956,635
1921	1,280,359	2,314,314	1,906,977	2,451,966	24,565,605	16,053,413
1922	1,768,549	2,866,366	3,839,116	4,478,405	29,375,466	17,574,579
1923	2,034,958	3,751,778	5,559,644	6,730,417	39,234,762	23,751,244
1924	2,169,899	3,718,973	4,403,893	4,995,268	41,376,425	23,455,393
1925	2,334,921	3,836,085	4,995,428	5,400,618	45,287,240	26,306,463

Year	Other sand		Gravel		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1916	9,089,550	$3,842,538	46,127,754	$12,220,146	89,091,732	$29,809,995
1917	8,866,876	4,962,232	35,573,819	13,508,189	76,419,325	35,296,932
1918	6,349,870	5,259,620	28,704,606	13,563,310	61,824,426	37,927,079
1919	8,397,979	6,345,654	34,606,671	19,561,877	70,576,407	45,951,556
1920	9,942,776	8,988,530	38,265,246	26,462,991	82,041,388	65,661,605
1921	10,542,013	8,230,257	41,550,054	27,434,295	79,845,008	56,484,245
1922	14,711,792	10,550,570	45,172,123	29,147,744	94,867,046	64,617,664
1923	20,535,907	14,240,126	72,566,882	42,430,089	139,932,153	90,903,654
1924	27,621,793	16,674,831	80,658,053	48,168,650	156,230,063	97,013,115
1925	34,564,633	19,605,159	84,819,251	52,393,798	172,001,473	107,542,123

Sand and gravel imported into and exported from the United States, 1916–1925

Year	Imports for consumption		Exports	
	Short tons	Value	Short tons	Value
1916	[1]	$87,144	[2]	$233,310
1917	[1]	142,586	[2]	494,251
1918	[1]	91,465	[2]	619,414
1919	597,481	126,586	[2]	382,070
1920	1,226,684	912,282	[2]	669,945
1921	906,905	771,734	[2]	379,982
1922	[3] 451,943	[3] 238,386	356,520	400,199
1923	[4] 477,762	[4] 259,820	551,233	598,633
1924	[4] 701,410	[4] 280,206	314,140	401,662
1925	[4] 534,555	[4] 233,422	425,612	496,050

[1] Quantities not recorded prior to July, 1918. During last six months of 1918 the imports were 284,036 tons, valued at $46,910.
[2] Quantities not recorded prior to 1922.
[3] Includes 65,848 tons of gravel, valued at $27,434, and 1,290 tons of glass sand, valued at $1,112, imported after new tariff went into effect Sept. 22. Not separately shown prior to that time.
[4] Includes: 1923, 198,960 tons of gravel, valued at $99,687, and 2,309 tons of glass sand, valued at $3,008; 1924, 448,586 tons, $155,146, and 6,479 tons, $1,961; and 1925, 224,600 tons, $89,505, and 4,186 tons, $2,262, respectively.

SAND-LIME BRICK

Sand-lime brick sold in the United States, 1916–1925[1]

Year	Number of operators	Thousands	Value	Year	Number of operators	Thousands	Value
1916	53	227,344	$1,474,073	1921 [2]	26	97,126	$1,268,502
1917	47	187,546	1,420,330	1922	(1)	(1)	(1)
1918	42	98,399	883,929	1923 [2]	33	213,425	2,471,536
1919	35	146,947	1,705,163	1924 [2]	37	283,417	3,334,503
1920	37	169,761	2,490,283	1925 [2]	42	315,595	3,780,639

[1] Canvass discontinued by U. S. Geological Survey after 1920. No canvass for 1922.
[2] According to Bureau of the Census. Figures represent production.

Imports of sand-lime brick were not reported separately until 1924. The figures for 1924 are 22,426,000 brick, valued at $129,042, and for 1925, 148,000 brick, $1,004.

Exports are not reported separately.

SELENIUM

Most of the selenium produced is a by-product in the electrolytic refining of copper.

Selenium, produced in the United States, sold in 1916–1925

Year	Pounds	Value	Year	Pounds	Value
1916	[1]	[1]	1921	55,978	$89,148
1917	39,630	$70,000	1922	126,565	177,542
1918	103,694	206,540	1923	127,174	237,196
1919	60,025	125,966	1924	153,762	286,066
1920	92,141	175,508	1925	194,007	330,637

[1] Bureau of Mines not at liberty to publish figures.

Selenium and selenium salts imported for consumption in the United States, 1916–1925

Year	Pounds	Value	Year	Pounds	Value
1916	[1]	$302	1921	1,106	$2,099
1917	[1]	2,236	1922	1,652	2,530
1918			1923	940	1,653
1919	[1]	25,866	1924	300	606
1920			1925	5,807	10,582

[1] Total quantity not recorded.

SILICA

Quartz sold or used by producers in the United States, 1916–1925

Year	Crude		Ground		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1916	70,417	$78,283	18,097	$164,503	88,514	$242,786
1917	126,575	120,856	16,098	197,213	142,673	318,069
1918	61,008	121,888	10,732	137,442	71,740	259,330
1919	51,774	135,187	11,558	238,384	63,332	373,571
1920	59,423	142,397	8,767	177,953	68,190	320,350
1921	8,570	39,660	2,682	45,297	11,252	84,957
1922	5,085	23,093	5,568	78,254	10,653	101,347
1923	14,159	66,723	6,442	126,907	20,601	193,630
1924	20,570	123,099	3,191	80,078	23,761	203,177
1925	22,312	143,861	3,132	61,515	25,444	205,376

Silica sold or used by producers in the United States for pottery, paints, fillers, polishers, abrasives, and other uses, 1924 and 1925

Material	1924		1925	
	Short tons	Value	Short tons	Value
Quartz (vein quartz, pegmatite, and quartzite)	23,761	$203,177	25,444	$205,376
Sand and sandstone [1]	230,432	1,655,056	263,981	1,857,263
Tripoli (including rottenstone) (ground and otherwise prepared)	28,476	389,409	29,388	434,886
Diatomaceous earth	63,163	693,917	73,030	922,281
	345,832	2,941,559	391,843	3,419,806

[1] Includes only finely ground material. Figures probably incomplete.

Imports of crude silica in 1925 were 22 short tons, valued at $486; in 1924, 12 tons, $254; and in 1923, 34 tons, $550. Similar imports were not recorded prior to September 22, 1922, but from that date to the end of the year 1 ton, valued at $45, was imported. The Bureau of Foreign and Domestic Commerce records imports of "flint, flints, and flint stones, unground," from several countries. These imports are partly flint pebbles for use in grinding mills and partly material for uses such as are listed above. The figures can not be accurately separated.

"Flint, flints, and flint stones, unground" imported for consumption in the United States, 1916–1925

Year	Short tons	Value	Year	Short tons	Value
1916	(1)	$313,120	1921	10,084	$116,157
1917	(1)	197,156	1922	16,040	145,805
1918	(1)	127,808	1923	15,952	130,974
1919	19,798	250,096	1924	17,473	114,958
1920	26,636	338,630	1925	16,240	105,041

[1] Quantities not recorded prior to July, 1918. During last six months of 1918 the imports were 5,224 tons, valued at $55,440.

No exports of silica are reported.

SILVER

[See under Gold and silver]

SLATE

Slate sold by producers in the United States, 1916–1925, by uses

Year	Roofing slate		Mill stock		Slate for other uses [1]	Total value
	Number of squares (100 square feet)	Value	Square feet	Value		
1916	835,873	$3,408,934	11,258,000	$1,623,323	$306,580	$5,338,837
1917	703,667	3,411,740	10,663,000	1,799,917	538,309	5,749,966
1918	379,817	2,219,131	7,204,000	1,853,603	768,386	4,841,120
1919	454,337	3,085,957	7,466,000	1,782,793	1,161,898	6,030,648
1920	396,230	3,524,658	9,910,000	3,147,281	2,054,503	8,726,442
1921	348,085	3,197,745	8,970,000	2,719,723	1,404,538	7,322,006
1922	479,243	4,069,761	9,276,800	2,899,195	2,207,828	9,176,784
1923	507,587	4,582,535	11,109,480	4,159,644	3,334,445	12,076,624
1924	469,393	4,626,614	10,009,180	3,922,366	3,227,036	11,776,016
1925	494,530	5,084,945	11,077,860	4,231,477	3,258,904	12,575,326

[1] Chiefly slate granules.

Value of slate sold by producers in the United States, 1922–1925, by States

State	1922	1923	1924	1925
Maine	$464,713	$754,826	$667,541	$604,062
Maryland	(1)	(1)	117,137	210,148
New York	642,972	927,398	962,276	851,715
Pennsylvania	4,324,294	5,587,670	5,157,868	5,885,179
Vermont	2,907,858	3,857,287	4,010,346	3,963,025
Virginia	[2] 312,652	[2] 321,010	[2] 336,627	[2] 377,082
Undistributed [3]	[4] 524,295	[4] 628,433	[4] 524,221	[4] 684,115
	9,176,784	12,076,624	11,776,016	12,575,326

[1] Included under "Undistributed."
[2] Exclusive of value of granules, etc., which is included under "Undistributed."
[3] 1922: Georgia, Maryland, New Jersey, and Tennessee; 1923: California, Georgia, Maryland, New Jersey, and Tennessee; 1921: California, Georgia, and Tennessee; 1925: Georgia, Tennessee, and Utah.
[4] Includes also value of granules, etc., for Virginia.

Slate sold by producers in the United States, 1924 and 1925, by uses

Use	1924		1925	
	Quantity	Value	Quantity	Value
Roofing—squares	469,393	$4,626,614	494,530	$5,084,945
Approximate equivalent in short tons	158,420		166,000	
Electrical—square feet	1,801,450	1,518,092	1,655,810	1,376,948
Approximate equivalent in short tons	12,900		11,900	
Structural and sanitary—square feet	2,346,050	951,964	2,332,700	862,019
Approximate equivalent in short tons	16,640		16,700	
Grave vaults and covers—square feet	566,160	142,167	523,850	125,582
Approximate equivalent in short tons	8,100		7,500	
Blackboards and bulletin boards—square feet	4,069,670	1,151,767	5,184,060	1,690,612
Approximate equivalent in short tons	10,930		13,900	
Billiard table tops—square feet	341,200	131,028	341,440	140,498
Approximate equivalent in short tons	2,400		2,500	
School slates—pieces	1,710,240	27,348	1,944,320	35,818
Approximate equivalent in square feet	884,650		1,040,000	
Approximate equivalent in short tons	1,200		1,400	
Granules—short tons	512,810	3,178,454	497,700	3,210,904
Other—short tons (estimated)	4,300	48,582	7,000	48,000
Total (quantities approximate, in short tons)	727,700	11,776,016	724,600	12,575,326

Value of slate imported for consumption in the United States, 1916–1925

1916	$2,200	1921	$2,923
1917	1,024	1922	2,753
1918	321	1923	16,881
1919	691	1924	32,095
1920	4,512	1925	64,570

Value of roofing slate exported from the United States, 1916–1925

1916	$27,630	1921	$101,630
1917	27,113	1922	97,811
1918	65,224	1923	78,780
1919	55,164	1924	77,422
1920	122,105	1925	54,130

The following figures for exports of slate other than roofing were collected by the Bureau of Mines from shippers of the products named:

Slate other than roofing exported from the United States, 1923–1925, by uses

Use	1923		1924		1925	
	Quantity	Value	Quantity	Value	Quantity	Value
School slates—cases [1]	21,502	$180,411	10,540	$113,865	11,050	$111,271
Electrical slate—square feet	[2] 209,594	[2] 105,332	[2] 47,870	[2] 44,874	[2] 36,540	[2] 32,333
Blackboards—do	91,267	30,442	128,180	38,998	149,470	68,086
Billiard tables—do	50,429	22,922	4,340	1,757	32,180	16,167
Structural—do	(2)	(2)	(2)	(2)	(2)	(2)
		339,107		199,494		227,857

[1] Cases weigh from 130 to 165 pounds each; average is 135 pounds.
[2] Small quantity of structural slate included with electrical.

Producers also report exporting 5,109 short tons of slate granules, valued at $38,126, in 1923; 8,780 tons, $54,400, in 1924; and 15,550 tons, $100,300, in 1925. Figures for earlier years are not available.

SOAPSTONE

[See Talc and soapstone]

SODIUM SALTS (NATURAL)

In addition to common salt, figures for which are given on page A78, the following quantities of other natural sodium salts (including carbonate, bicarbonate, sulphate, trona, and borax) and colemanite have been shipped by the producers.

Sodium salts (other than NaCl), derived from natural sources in the United States, shipped by producers, 1916–1925

Year	Short tons	Value	Year	Short tons	Value
1916	13,231	$545,000	1921	25,000	$894,000
1917	21,743	895,602	1922	45,406	1,415,774
1918	24,053	992,788	1923	59,440	1,775,940
1919	29,120	874,083	1924	76,420	1,825,850
1920	42,683	1,513,179	1925	73,300	2,095,110

Borates (colemanite and naturally occurring borax) shipped by producers in the United States, 1916–1925

Year	Short tons	Value	Year	Short tons	Value
1916	103,525	$2,409,459	1921	50,000	$1,600,000
1917	108,875	3,609,632	1922	85,220	2,705,140
1918	88,794	2,263,230	1923	136,650	3,994,790
1919	66,146	1,380,000	1924	116,110	3,183,910
1920	120,320	2,173,000	1925	113,700	3,085,660

STEEL

[See Iron ore, pig iron, and steel]

STONE

Stone sold or used by producers in the United States, 1916–1925, by varieties

Year	Granite		Basalt and related rocks (trap rock)		Sandstone		Marble	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1916	9,270,800	$17,456,838	10,233,640	$7,666,297	4,681,590	$5,603,778	409,970	$7,033,171
1917	5,564,200	15,544,957	9,103,580	7,570,885	3,880,500	5,512,421	310,130	6,330,387
1918	3,827,400	14,466,423	6,859,200	7,782,280	2,858,100	4,529,298	305,720	5,496,389
1919	4,221,220	19,345,714	7,410,770	8,944,686	2,623,270	5,283,842	333,400	8,042,297
1920	4,760,000	24,954,908	9,219,200	12,260,148	3,343,000	7,310,290	431,500	11,069,585
1921	4,752,180	20,592,217	8,524,480	11,450,899	2,640,460	6,425,339	315,400	8,580,416
1922	5,913,120	21,125,869	10,032,900	12,600,611	3,388,130	7,521,044	427,870	10,534,671
1923	7,300,130	29,704,796	10,674,470	13,539,648	4,349,270	9,174,706	562,560	12,863,974
1924	6,883,860	28,772,161	11,671,500	14,679,523	3,894,690	10,142,099	516,000	13,302,235
1925	8,074,200	30,531,347	11,842,110	14,770,042	4,479,330	10,920,016	564,150	13,882,457

Year	Limestone		Other stone [1]		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1916	67,235,000	$41,309,599			91,831,000	$79,069,683
1917	63,481,500	46,263,379	1,234,990	$993,642	83,574,900	82,215,671
1918	53,868,200	49,453,006	844,740	973,034	68,563,360	82,700,430
1919	49,759,800	53,171,701	1,190,540	1,920,903	65,539,000	96,709,143
1920	59,290,000	75,655,260	1,483,300	2,291,769	78,527,000	133,541,960
1921	45,621,000	57,749,594	1,685,220	2,163,801	63,538,740	106,962,266
1922	58,928,660	68,397,927	1,520,880	1,886,806	80,211,560	122,066,928
1923	76,701,360	89,620,007	3,730,870	4,567,110	103,318,660	159,470,241
1924	75,894,430	89,868,956	4,323,640	5,105,139	103,184,120	161,870,113
1925	85,649,440	98,008,028	5,242,140	6,104,902	115,851,370	174,216,792

[1] Includes mica schist, conglomerate, argillite, various light-colored volcanic rocks, serpentine not used as marble, and such other stone as can not be properly classed in any of the main groups.

Stone sold or used by producers in the United States, 1924 and 1925, by uses

Use	1924		1925	
	Quantity	Value	Quantity	Value
Building stone—cubic feet	28,352,380	$33,175,656	30,695,310	$35,444,809
Approximate equivalent in short tons	2,211,750		2,392,420	
Monumental stone—cubic feet	4,750,980	15,305,386	4,371,380	14,404,339
Approximate equivalent in short tons	393,550		363,060	
Paving blocks—number	41,037,570	3,578,676	40,143,220	3,680,687
Approximate equivalent in short tons	375,860		380,710	
Curbing—cubic feet	3,815,850	3,468,821	5,075,620	4,313,446
Approximate equivalent in short tons	296,070		393,460	
Flagging—cubic feet	810,440	560,156	762,280	562,344
Approximate equivalent in short tons	59,840		55,790	
Rubble—short tons	864,790	1,160,258	1,197,170	2,060,868
Riprap—do	3,265,130	3,634,439	3,079,270	2,794,379
Crushed stone—do	68,198,440	73,861,576	75,672,930	80,508,429
Furnace flux (limestone and marble)—do	19,690,490	15,839,868	22,860,890	17,344,190
Refractory stone (ganister, mica schist, and dolomite)—short tons	1,093,940	1,389,413	1,261,130	1,548,190
Manufacturing industries (limestone and marble)—short tons	4,733,770	4,410,559	5,171,520	4,941,669
Other uses (chiefly agricultural limestone)—do	2,000,490	5,485,305	3,023,020	6,613,442
Total (quantities approximate, in short tons)	103,184,120	161,870,113	115,851,370	174,216,792

Value of stone imported for consumption in the United States, 1916–1925

1916	$959,367	1921	$1,253,959
1917	681,475	1922	1,895,912
1918	268,577	1923	2,641,337
1919	787,961	1924	2,437,654
1920	1,795,575	1925	2,909,887

Stone imported for consumption in the United States, 1924 and 1925, by kinds

Kind	1924		1925	
	Quantity	Value	Quantity	Value
Marble, breccia, and onyx:				
In blocks, rough, etc—cubic feet	654,510	$1,278,696	642,113	$1,326,863
Sawed—do	196	655	113	576
Slabs or paving tiles—superficial feet	309,999	97,935	671,561	210,072
All other manufactures		205,353		257,382
Mosaic cubes of marble or onyx:				
Loose		13,016		14,919
Attached to paper		142		346
		1,595,797		1,810,158
Granite:				
Dressed		302,927		359,364
Rough—cubic feet	196,176	255,225	213,594	273,298
		558,152		632,662
Stone (other):				
Dressed		22,044		12,996
Rough (monumental or building stone)—cubic feet	152,431	122,309	212,953	167,306
Rough (other)		139,352		286,765
		283,705		467,067
Grand total		2,437,654		2,909,887

Value of stone exported from the United States, 1916–1925

Year	Marble and stone, unmanufactured	All other, manufactured	Total	Year	Marble and stone, unmanufactured	All other, manufactured	Total
1916	$403,363	$1,077,447	$1,480,750	1921	$576,905	$1,697,570	$2,274,475
1917	572,097	1,108,185	1,680,282	1922	681,658	903,102	1,584,760
1918	552,261	1,208,164	1,760,425	1923	625,442	783,195	1,408,637
1919	770,392	1,508,997	2,279,389	1924	499,602	448,731	948,333
1920	774,442	2,158,764	2,933,206	1925	507,391	725,677	1,233,068

STRONTIUM

Domestic strontium ore sold in the United States, 1916–1918 [1]

Year	Short tons	Value
1916	250	$3,650
1917	4,035	87,700
1918	400	20,000

[1] The Bureau of Mines has no record of the production of domestic strontium ore prior to 1916, and no production has been reported since 1918.

Strontium chemicals, manufactured in the United States from domestic and imported crude ore, sold in 1916–1924 [1]

Year	Pounds	Value	Year	Pounds	Value
1916	2,006,000	(2)	1921	847,368	$118,655
1917	2,499,676	(2)	1922	2,040,550	204,022
1918	4,148,270	$622,546	1923	2,676,260	303,719
1919	2,191,409	402,057	1924	3,061,532	303,456
1920	4,713,015	864,251			

[1] Canvass discontinued after 1924. [2] Figures for value not available prior to 1918.

Imports of strontium ore have been as follows: 1925, 1,132 short tons, valued at $22,082; 1924, 1,661 tons, $14,487; 1923, 1,679 tons, $12,564. No record of similar imports was kept prior to the new tariff (September 22, 1922), but from that date until the end of the year 1,000 pounds, valued at $40, was imported.

Strontium chemicals and ore imported for consumption in the United States, 1916–1925 [1]

Year	Pounds	Value	Year	Pounds	Value
1916	(2)	$11,049	1921	1,212,758	$4,393
1917	(2)	23,216	1922 [1]	390,644	22,986
1918	(2)	2,459	1923	5,281,818	131,420
1919	1,225,952	3,380	1924	3,993,226	59,937
1920	1,659,083	15,479	1925	4,826,612	162,533

[1] Celestite (strontium sulphate ore), strontium nitrate, and some other chemicals not included in record prior to Sept. 22, 1922.
[2] Quantities not recorded prior to July, 1918. During last six months of 1918 the imports were 185,920 pounds, valued at $356.

No exports of strontium ore or strontium chemicals have been reported.

SULPHUR

Sulphur produced and shipped in the United States, 1916–1925

Year	Produced (long tons)	Shipped		Year	Produced (long tons)	Shipped	
		Long tons	Approximate value			Long tons	Approximate value
1916	649,683	766,835	$12,246,000	1921	1,879,150	954,344	$17,000,000
1917	1,134,412	1,120,378	23,987,000	1922	1,830,942	1,343,624	22,000,000
1918	1,353,525	1,266,709	27,868,000	1923	2,036,097	1,618,841	26,000,000
1919	1,190,575	678,257	10,252,000	1924	1,220,561	1,537,345	25,000,000
1920	1,255,249	1,517,625	30,000,000	1925	1,409,262	1,858,003	29,000,000

Sulphur imported into and exported from the United States, 1916–1925

Year	Imports for consumption		Exports	
	Long tons	Value	Long tons	Value
1916	22,235	$404,784	128,755	$2,505,857
1917	1,015	29,340	152,736	3,500,819
1918	82	9,542	131,092	3,626,638
1919	101	8,633	224,712	6,325,552
1920	136	26,828	477,450	8,994,350
1921	50	5,878	285,762	4,524,768
1922	296	14,743	487,969	7,209,357
1923	465	21,535	474,475	7,216,107
1924	1,005	40,293	484,143	7,894,201
1925	100	4,411	632,250	11,153,781

TALC AND SOAPSTONE

Talc and soapstone sold by producers in the United States, 1916–1925, by classes

Year	Crude		Sawed and manufactured				Ground		Total	
			Talc		Soapstone					
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1916	11,824	$108,283	828	$102,674	19,127	$489,606	181,182	$1,553,240	212,961	$2,253,803
1917	12,619	69,140	5,781	176,404	19,885	402,506	180,563	1,644,828	218,848	2,292,878
1918	17,633	193,278	1,075	116,952	12,330	501,059	177,269	1,869,730	208,307	2,681,019
1919	15,625	73,437	921	147,339	16,504	530,163	151,793	1,601,736	184,843	2,352,675
1920	11,008	43,820	1,415	139,335	19,707	709,400	178,505	2,142,894	210,635	3,035,449
1921	2,150	12,911	(1)	(1)	[1] 17,423	[1] 627,826	102,413	1,115,205	121,986	1,755,942
1922	4,981	22,582	654	86,333	22,700	712,144	170,349	2,038,838	198,684	2,859,897
1923	5,706	50,125	682	114,772	22,857	932,098	167,447	1,915,258	196,692	3,012,253
1924	5,710	22,247	846	109,405	25,630	1,288,885	171,635	2,095,019	203,821	3,515,556
1925 [2]	5,684	24,533	895	107,691	(3)	(3)	175,677	1,879,569	182,256	2,011,793

[1] Talc included under "Soapstone."
[2] Figures for 1925 represent talc only.
[3] Bureau of Mines not at liberty to publish figures for soapstone.

Talc imported for consumption in the United States, 1916–1925

Year	Crude and unground steatite and French chalk		Manufactures (except toilet preparations) wholly or partly finished [1]		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1916	2,027	$12,645	16,855	$218,230	18,882	$230,875
1917	2,452	10,710	16,157	258,787	18,609	269,497
1918	1,434	9,253	12,735	251,323	14,169	260,576
1919	1,641	10,105	12,961	248,899	14,602	259,004
1920	941	7,206	21,739	443,514	22,680	450,720
1921	153	2,279	11,468	239,469	11,621	241,748
1922	248	9,850	18,196	367,528	18,444	377,378
1923	560	20,653	19,405	402,238	19,965	422,891
1924	313	4,847	17,496	337,508	17,809	342,355
1925	121	6,547	20,872	443,985	20,993	450,532

[1] Prior to new tariff, Sept. 22, 1922, the classification was "Talc, steatite, and French chalk—cut, ground, or washed."

No material that might be classed as soapstone is imported.

Exports of "talcum and other toilet powders" have been as follows: 1925, 1,734 short tons, valued at $1,882,196; 1924, 1,614 tons, $1,688,211; 1923, 1,907 tons, $1,671,588; 1922, 1,821 tons, $1,397,542. Exports were not separately classified prior to 1922.

TANTALUM

Columbite, mined in the United States, shipped in 1918–1925 [1]

Year	Pounds	Value	Year	Pounds	Value
1918	4,500	$2,250	1922	600	$240
1919	300	90	1923	1,350	540
1920	4,000	1,450	1924	1,197	598
1921	3,400	1,150	1925		

[1] For several years prior to 1918 there was no market for tantalum or columbium minerals, and they were therefore not produced.

No imports of tantalum or tantalum ores were recorded for 1917 to 1919, 1922, or 1924. For other years in the decade 1916 to 1925 imports have been recorded as follows: 1916, "ferro-alloys (tantalum)," valued at $2,000, quantity not shown; 1920, 60 pounds of "ferro-alloys (tantalum)," $54; 1921, 1,229 pounds of "ferro-alloys (tantalum)," $788, and 6,785 pounds of "steel-hardening ores (tantalum)," $1,327; 1923, 5,600 pounds of "ores of ferro-alloying metals (tantalum)," $3,031; 1925, 5,022 pounds of "ores of ferro-alloying metals (tantalum)," $1,347.

No separate record of exports is kept.

TELLURIUM

Tellurium is a by-product of the electrolytic refining of copper. Figures of production are not available for publication. Imports and exports of tellurium are not reported.

THORIUM MINERALS

In 1925, 2,000 pounds of monazite, estimated to contain 6 per cent of thoria, was shipped from Florida. The value of this monazite is estimated by the Bureau of Mines as $120. No monazite is known to have been produced in the United States from 1918 to 1924. Production in 1917 was 22,000 pounds, valued at $1,760, and in 1916, 37,872 pounds, valued at $3,400.

Monazite sand and thorium nitrate imported for consumption in the United States, 1916–1925

Year	Monazite sand		Thorium nitrate	
	Pounds	Value	Pounds	Value
1916	2,436,197	$188,383	909	$3,884
1917	5,828,270	355,017	1,188	2,359
1918	2,994,515	204,661		
1919	632,568	48,768	3,307	5,250
1920	1,814,183	141,528	35,640	43,221
1921	50	40	44,554	89,672
1922	3,466,844	210,187	43,254	42,096
1923	253,730	11,334	24,027	29,789
1924	546,560	18,320	14,150	13,721
1925			21,519	22,661

Exports of thorium nitrate in 1922 amounted to 1,103 pounds, valued at $3,149. Data for other years are not separately shown.

TIN

Tin mined in the United States (including Alaska), 1916–1925

[Metallic tin obtainable from concentrates produced in tin mining]

Year	Short tons	Value [1]	Year	Short tons	Value [1]
1916	140	$122,000	1921	4	$2,400
1917	110	135,600	1922	[2] 1	912
1918	69	118,500	1923	2	1,623
1919	56	73,400	1924	7	7,028
1920	22	22,000	1925	14	15,980

[1] Value calculated at average price per pound of Straits tin in New York, as published by American Metal Market.
[2] 2,800 pounds.

Smelter production of metallic tin in the United States, 1916–1925, in short tons

1916	2,261	1921	11,542
1917	6,065	1922	9,108
1918	10,284	1923	7,466
1919	12,236	1924	486
1920	17,652	1925	------

Secondary tin recovered as metal and in alloys and chemical compounds in the United States, 1916–1925

Year	Short tons	Value	Year	Short tons	Value
1916	17,400	$15,131,040	1921	16,900	$9,668,500
1917	19,400	23,920,200	1922	19,510	12,443,500
1918	23,837	41,381,000	1923	30,210	25,316,000
1919	24,033	29,868,200	1924	31,300	31,062,100
1920	23,500	22,705,700	1925	30,950	35,165,400

Metallic tin imported for consumption in the United States, 1916–1925

Year	Short tons	Value	Year	Short tons	Value
1916	69,035	$51,802,232	1921	27,101	$16,645,719
1917	72,166	63,860,340	1922	67,416	40,797,986
1918	71,254	93,144,218	1923	77,206	61,092,354
1919	44,849	50,890,019	1924	72,866	68,953,193
1920	62,795	73,440,872	1925	85,843	95,121,111

Tin ore (concentrate) imported into the United States, 1916–1925

[General imports]

Year	Short tons	Value	Year	Short tons	Value
1916	8,040	$4,032,460	1921	15,340	$5,672,861
1917	9,054	4,743,099	1922	13,804	5,504,434
1918	18,394	11,444,401	1923	3,015	2,169,055
1919	19,196	11,871,948	1924	[1] 174	71,094
1920	34,148	18,795,162	1925	[1] 214	98,489

[1] Recorded as tin content.

Exports of tin ore are insignificant.

Metallic tin (pigs, bars, etc.) of domestic manufacture exported from the United States, 1916–1925

Year	Short tons	Value	Year	Short tons	Value
1916	346	$365,176	1921	1,154	$748,077
1917	206	232,401	1922	901	574,792
1918	20	31,952	1923	840	646,250
1919	306	415,921	1924	409	453,482
1920	706	770,375	1925	404	445,782

TITANIUM MINERALS

Titanium minerals produced in the United States, 1916–1925

Year	Rutile concentrates			Ilmenite concentrates		
	Short tons	Percentage of TiO_2	Value	Short tons	Percentage of TiO_2	Value
1916	110	95	$16,500	95	55	$1,900
1917	206	93	32,960	1,339	53–55	12,677
1918	261	95	39,150	1,644	53–55	18,600
1919 [1]	102	94–96	20,400	106	48–50	2,120
1920	277	94–96	(2)	268	50	(2)
1921						
1922	310	95	(2)	5,181	52–54	(2)
1923	270	95	(2)	6,270	52	(2)
1924				4,769	52	[3] 76,300
1925	46	95	[3] 11,000	5,566	52	[3] 89,000

[1] Virginia production only; information regarding Florida not available for publication.
[2] Bureau of Mines not at liberty to publish value.
[3] Estimate by Bureau of Mines.

No titanium or "titanium steel-hardening" ores have been imported since 1918. Imports of such ores during last six months of 1918 were 1,606 pounds, valued at $221. No separate record of similar imports was kept prior to July, 1918. Imports of "titanium potassium oxalate and all compounds and mixtures containing titanium" amounted to 81,721 pounds, valued at $12,368, in 1925; to 24,134 pounds, $3,639, in 1924; to 39,763 pounds, $6,423, in 1923; and to 82,544 pounds, $20,596, from September 22 to December 31, 1922. Similar imports were not separately classified prior to new tariff. For imports of ferrotitanium see under Ferro-alloys.

No separate record of exports of titanium, "titanium steel-hardening" ores, or ferrotitanium is kept.

TRIPOLI

[See Abrasive materials]

TUNGSTEN

Concentrated tungsten ores (carrying 60 per cent of tungsten trioxide), produced in the United States, sold in 1916–1925, and average value per unit

Year	Short tons	Value		Year	Short tons	Value	
		Total	Average per unit			Total	Average per unit
1916	5,923	$12,074,000	$33.98	1921			
1917	6,144	6,783,000	18.40	1922			
1918	5,061	7,049,300	23.24	1923	241	$144,600	$10.00
1919	327	353,900	18.02	1924	565	287,000	8.47
1920	216	101,800	7.86	1925	1,191	755,500	10.57

Tungsten-bearing ores[1] imported for consumption in the United States, 1916–1925

Year	Short tons	Value	Year	Short tons	Value
1916	3,973	$7,353,691	1921	1,614	$276,757
1917	4,876	4,465,590	1922	1,651	279,190
1918	11,750	11,552,218	1923		
1919	9,408	6,261,190	1924		
1920	1,949	779,593	1925	427	206,326

[1] Prior to Sept. 22, 1922, imports recorded as ore; beginning with new tariff, recorded as tungsten content of ore.

For imports of tungsten and ferrotungsten see under Ferro-alloys.

For 1922 the following domestic exports are recorded: "Tungsten ores and concentrates (tungsten content)," 717 pounds, valued at $594. No tungsten ores of domestic production are recorded as exported in 1916 to 1921, and, although exports for later years are not separately shown, it is practically certain that no domestic ores have been exported.

For exports of tungsten and ferrotungsten see under Ferro-alloys.

URANIUM AND VANADIUM ORES

The market for radium has been so overshadowed by the uranium deposits of Katanga, Belgian Congo, that only one company was able to isolate radium in the United States in 1924 and 1925.

Uranium and vanadium ores shipped from mines in the United States, 1916–1925

Year	Ores		Radium isolated (grams)	Estimated content of ores		
	Short tons	Approximate value as ore		Radium (grams)	Uranium (short tons)	Vanadium (short tons)
1916	20,300	$500,000	[1]	10.0	33.7	460
1917	33,404	617,660	11.96	26.4	87.4	484
1918	18,860	957,060	21.7	27.1	89.5	276
1919	14,509	1,630,900	28.648	29.0	95.7	284.2
1920	35,076	2,401,000	32.539	43.4	143.5	526.7
1921	8,540	876,000	35.693	33.0	109.0	201.5
1922	929	166,016	24.189	7.0	23.2	25.9
1923	2,025	150,000	12.212	5.5	18.2	63.3
1924	[2]	[2]	[2]	[2]	[2]	[2]
1925	13,070	331,000	[2]	4.3	14.3	216

[1] Figures not available.

[2] Bureau of Mines not at liberty to publish figures.

Value of uranium salts and oxide, including radium salts, imported for consumption in the United States, 1916–1925

1916	$5,065	1921	$8,552
1917	2,930	1922	28,685
1918	274	1923	500,456
1919	12,960	1924	418,307
1920	3	1925	480,889

No imports of "uranium-radium ore (steel-hardening)" were recorded for 1922 to 1925 and for 1919. Imports in 1920 and 1921 were 396 pounds, $1,110, and 250 pounds, $446, respectively. Similar imports were not recorded separately prior to July 1, 1918, but from that date to the end of the year 157 pounds, valued at $4,840, was imported.

Vanadium ore (steel-hardening) imported for consumption in the United States, 1918–1925

Year	Short tons	Value	Year	Short tons	Value
1918—July to December [1]	886	$5,333	1922	306	$86,776
1919	3,013	67,846	1923	2,089	229,210
1920	10,337	1,080,935	1924	7,058	722,731
1921	5,154	543,061	1925	2,368	339,468

[1] Not separately classified prior to July, 1918.

For imports of ferrovanadium, see under Ferro-alloys.

No separate record is kept of vanadium exports. For exports of ferrovanadium, see under Ferro-alloys.

ZINC [1]

Primary zinc produced in the United States from domestic ores, 1916–1925

Year	Short tons	Value	Year	Short tons	Value
1916	564,338	$151,243,000	1921	198,232	$19,823,000
1917	584,597	119,258,000	1922	353,274	40,273,000
1918	492,405	89,618,000	1923	508,335	69,134,000
1919	452,272	66,032,000	1924	515,831	67,058,000
1920	450,045	72,907,000	1925	555,631	84,456,000

[1] For prices of zinc see statement on p. A15.

Primary zinc produced in the United States, 1921–1925, by sources of ore, in short tons

Source	1921	1922	1923	1924	1925
United States	198,232	353,274	508,335	515,831	555,631
Foreign:					
Australia	133				
Canada	521	55		1,396	7,997
Mexico	1,614	948	2,099	112	9,318
Total foreign	2,268	1,003	2,099	1,508	17,315
Grand total	200,500	354,277	510,434	517,339	572,946

Primary zinc produced in the United States, 1921–1925, by localities in which smelted, in short tons

Location of smelter	1921	1922	1923	1924	1925
Arkansas	15,278	13,627	29,870	28,447	27,145
Illinois	48,865	76,266	93,239	93,370	109,672
Kansas	16,573	24,167	32,006	28,640	25,765
Oklahoma	41,244	74,537	119,744	118,487	138,906
Pennsylvania	36,378	57,319	82,003	83,016	99,899
Other States	42,162	108,361	153,572	165,379	171,559
	200,500	354,277	510,434	517,339	572,946

Secondary zinc recovered as metal in the United States, 1916–1925, in short tons

Year	Redistilled	Remelted	Recovered in alloys, excluding old brass remelted	Recovered in remelted brass (estimate)
1916	28,776	21,037	2,600	61,700
1917	16,835	14,565	4,800	80,000
1918	9,918	17,190	11,082	82,400
1919	19,748	20,162	6,062	62,400
1920	21,371	21,479	7,650	65,000
1921	17,573	16,260	5,840	38,600
1922	32,988	36,326	10,250	60,000
1923	39,434	25,776	8,630	65,000
1924	35,486	23,400	10,500	63,000
1925	39,181	22,249	13,300	53,300

Zinc imported for consumption in the United States, 1916–1925

Year	Blocks or pigs		Sheets		Old		Zinc dust		Manufactures	Total value
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value		
1916	21	$4,436	2	$432	642	$112,254	522	$230,380	$829	$348,331
1917	18	2,279	73	16,570	259	25,974	233	48,604	250	93,677
1918	11	2,897	(1)	29	24	2,056	16	3,552	331	8,865
1919	32	2,284	1	249	37	2,216	52	5,753	1,258	11,760
1920	(1)	17	4	614	14	1,065	17	6,207	1,746	9,649
1921	6,598	559,870	6,688	496,445	6	341	42	1,121	8,290	1,066,067
1922	40	3,327	416	59,037	46	2,403	79	5,614	9,517	79,898
1923	1	375	(1)	41	20	1,624	4	891	16,331	19,262
1924	11	1,973	(1)	88	14	1,493	59	9,241	20,089	32,884
1925	(1)	303	(1)	55	24	2,495	116	20,936	18,979	42,768

[1] Less than 1 ton.

Zinc content of zinc ores [1] imported for consumption in the United States, 1916–1925

Year	Short tons	Value	Year	Short tons	Value
1916	55,796	$3,836,414	1921	9,387	$252,951
1917	33,517	1,123,534	1922	[2] 1,895	18,903
1918	8,501	291,449	1923	[2] 2,007	273,105
1919	2,978	119,540	1924	[2] 332	32,850
1920	6,971	198,156	1925	[2] 57	6,205

[1] Classification as follows: 1916–1922, "Ore, zinc-bearing, including calamine (zinc content)"; 1923–1925, "Zinc ores (zinc content)."
[2] Content of ore imported duty free and containing less than 10 per cent of zinc is separately recorded after Sept. 21, 1922, but is excluded from figures as zinc content is not recovered.

Zinc exported from the United States, 1916–1925

Year	Domestic				Foreign	
	Slabs		Sheets		Slabs	
	Short tons	Value	Short tons	Value	Short tons	Value
1916	150,623	$46,770,901	12,512	$4,540,146	43,230	$8,080,442
1917	137,282	32,605,767	16,514	5,730,792	64,680	12,429,356
1918	66,369	12,469,622	13,875	4,566,756	20,069	3,565,127
1919	109,746	17,524,153	19,762	5,212,002	12,256	1,943,507
1920	74,046	12,495,144	11,852	2,832,993	28,132	4,331,636
1921	1,753	204,984	1,816	425,618	1,256	100,677
1922	26,815	2,994,625	3,217	574,491	3,471	429,122
1923	42,131	5,961,525	3,732	764,369	7,080	941,257
1924	[1] 72,583	[1] 9,538,459	3,658	784,728	(1)	(1)
1925	[1] 76,351	[1] 11,654,441	4,196	926,841	(1)	(1)

[1] Foreign included with domestic. Not separately recorded after 1923.

ZINC RESIDUUM

[See Manganiferous zinc residuum]

ZIRCONIUM MINERALS

The Bureau of Mines is advised that shipments of zircon from Pablo Beach, Fla., have been as follows: 1925, 624 short tons; 1924, 281 tons; 1923, 153 tons; and 1922, 10 tons. The bureau estimates the value as $87,360, $39,340, $21,420, and $1,150, respectively. No shipments were reported for 1916 to 1921. Brazil is the world's main producer of zirconium ores. The zirconium minerals produced in Brazil and exported consist of the silicate, zircon, and the oxide, baddeleyite.

Zirconium ores (steel-hardening) imported for consumption in the United States, 1918–1925

Year	Pounds	Value	Year	Pounds	Value
1918—July to December [1]	3,216,659	$77,250	1922	67,037	$4,072
1919	11,023	332	1923		
1920			1924	616,220	4,878
1921	131,016	3,003	1925		

[1] Not separately classified prior to July, 1918.

STATE TABLES

Mineral production of Alabama in 1924 and 1925

Product	1924		1925	
	Quantity	Value	Quantity	Value
Asphalt (native)—short tons	8,498	$29,743	23,550	$77,080
Barite—do	[1]	[1]		
Cement—barrels	[2] 5,542,687	[2] 9,147,367	[2] 6,045,967	[2] 9,824,439
Clay products		[3] 4,234,736		[3] 4,987,896
Clay, raw—short tons	86,939	[4] 120,945	107,340	[4] 169,311
Coal—do	19,130,184	44,756,000	20,004,395	42,442,000
Coke—do	4,541,058	[4] 17,404,066	4,670,481	[4] 16,801,841
Ferro-alloys—long tons	[1 4]	[1 4]	[1 4]	[1 4]
Fuller's earth—short tons	[1]	[1]		
Graphite, crystalline—pounds	584,725	13,935	[1]	[1]
Iron ore—long tons	6,557,596	13,927,551	6,891,081	14,134,677
Iron, pig—do	2,667,361	[4] 55,791,228	2,910,370	[4] 57,777,275
Lime—short tons	204,059	1,812,282	207,699	1,679,155
Manganese ore—long tons	1,242	24,954	938	12,544
Manganiferous ore—do	611	6,722	298	3,087
Mica:				
Scrap—short tons			[1]	[1]
Sheet—pounds	[1]	[1]	[1]	[1]
Mineral waters—gallons sold	[5]	[5]	[5]	[5]
Sand and gravel—short tons	2,443,753	917,914	2,683,042	1,244,398
Stone—do	1,253,990	2,003,521	1,392,790	2,142,595
Miscellaneous [6]		2,493,135		2,452,235
Total value, eliminating duplications		77,315,758		77,139,340

[1] Value included under "Miscellaneous."
[2] Exclusive of puzzolan, value for which is included under "Miscellaneous."
[3] Figures obtained through cooperation with Bureau of the Census.
[4] Value not included in total value for State.
[5] No canvass.
[6] Includes minerals indicated by "1" and "2" above.

Mineral production of Alaska in 1924 and 1925

Product	1924		1925	
	Quantity	Value	Quantity	Value
Coal—short tons	99,663	$560,000	82,868	$405,000
Copper—pounds	74,074,207	9,703,721	73,855,298	10,487,452
Gold—troy ounces	304,072	6,285,724	307,679	6,360,281
Lead—short tons	631	100,899	789	137,286
Natural gas—M cubic feet	[1]	[1]	[1]	[1]
Natural-gas gasoline—gallons			33,000	5,000
Petroleum—barrels	[1]	[1]	8,000	34,000
Platinum and allied metals—troy ounces	779	65,131	2,862	224,570
Silver—do	669,641	448,659	698,259	484,592
Stone—short tons	[1]	[1]	[1]	[1]
Tin (metallic equivalent)—do	7	7,028	14	15,980
Miscellaneous [2]		190,672		132,159
Total value, eliminating duplications		17,361,834		18,286,320

[1] Value included under "Miscellaneous."
[2] Includes minerals indicated by "1" above.

Mineral production of Arizona in 1924 and 1925

Product	1924		1925	
	Quantity	Value	Quantity	Value
Arsenious oxide ---- short tons	[1]	[1]		
Asbestos ---- do	132	$30,551	[1]	[1]
Barite ---- do			[1]	[1]
Clay products		[2] 98,564		[2] $181,358
Clay, raw ---- short tons			[1 3]	[1 3]
Copper ---- pounds	677,752,013	88,785,514	713,355,129	101,296,428
Feldspar (crude) ---- long tons	[1]	[1]	[1]	[1]
Gems and precious stones		[4]		[4]
Gold ---- troy ounces	235,996	4,878,465	201,741	4,170,355
Gypsum ---- short tons	[1]	[1]	[1]	[1]
Lead ---- do	9,321	1,491,385	11,938	2,077,213
Lime ---- do	27,972	331,756	39,045	394,023
Manganese ore ---- long tons	42	798	294	5,102
Mercury ---- flasks	[1]	[1]	30	[1]
Pyrite (radio crystals) ---- pounds	3,105	1,617	[1]	[1]
Sand and gravel ---- short tons	69,225	17,752	[1]	[1]
Silver ---- troy ounces	6,649,276	4,455,015	7,257,868	5,036,961
Sodium sulphate from natural sources ---- short tons	[1]	[1]	[1]	[1]
Stone ---- do	160,350	176,768	435,060	306,763
Sulphuric acid (60° Baumé) [5] ---- do	19,665	[1 3]	10,602	[1 3]
Tungsten ore (60 per cent concentrates) ---- do			9	5,200
Zinc ---- do			3,666	557,241
Miscellaneous [6]		175,294		263,543
Total value, eliminating duplications		100,327,062		114,202,670

[1] Value included under "Miscellaneous."
[2] Figures obtained through cooperation with Bureau of the Census.
[3] Value not included in total value for State.
[4] No canvass.
[5] From copper smelting.
[6] Includes minerals indicated by "[1]" above.

Mineral production of Arkansas in 1924 and 1925

Product	1924		1925	
	Quantity	Value	Quantity	Value
Antimony ore ---- short tons	100	$6,787	[1]	[1]
Bauxite ---- long tons	327,630	1,981,000	296,320	$1,878,450
Clay products		[2 3] 1,356,425		[2 3] 1,689,611
Clay, raw ---- short tons	166	[4] 1,570	623	[4] 2,634
Coal ---- do	1,451,503	5,898,000	1,220,039	4,829,000
Gems and precious stones		[5]		[5]
Iron ore sold for magnets ---- long tons	5	[1]	4	[1]
Lead ---- short tons	20	3,200	58	10,092
Lime ---- do	13,984	131,108	24,791	223,965
Manganese ore ---- long tons	3,400	60,350	3,517	79,335
Manganiferous ore ---- do	7,991	37,170	5,076	23,140
Mineral waters ---- gallons sold	[5]	[5]	[5]	[5]
Natural gas ---- M cubic feet	36,616,000	4,908,000	41,878,000	5,394,000
Natural-gas gasoline ---- gallons	17,533,000	1,784,000	19,686,000	2,420,000
Oilstones and scythestones ---- short tons	214	143,264	255	165,018
Petroleum ---- barrels	46,028,000	43,130,000	77,398,000	68,880,000
Sand and gravel ---- short tons	2,944,022	1,560,379	2,059,893	1,078,303
Silver ---- troy ounces			3,118	2,164
Stone ---- short tons	[6] 542,190	[6] 620,626	374,940	448,313
Zinc ---- do	4	520	43	6,536
Miscellaneous [7]		128,170		57,605
Total value, eliminating duplications		61,748,999		87,185,532

[1] Value included under "Miscellaneous."
[2] Figures obtained through cooperation with Bureau of the Census.
[3] Exclusive of pottery, value for which is included under "Miscellaneous."
[4] Value not included in total value for State.
[5] No canvass.
[6] Exclusive of sandstone, value for which is included under "Miscellaneous."
[7] Includes minerals indicated by "[1]", "[3]", and "[6]" above.

Mineral production of California in 1924 and 1925

Product		1924		1925	
		Quantity	Value	Quantity	Value
Antimony ore	short tons	13	$417		
Arsenious oxide	do	(1)	(1)		
Asbestos	do	(1)	(1)	(1)	(1)
Asphalt (native)	do	3,731	14,088	2,680	$16,100
Borates	do	(1)	(1)	(1)	(1)
Briquets, fuel	do	(1 2)	(1 2)	(1 2)	(1 2)
Calcium chloride	do			(1)	(1)
Cement	barrels	11,481,730	25,532,707	13,109,426	26,159,531
Chromite	long tons	(1)	(1)	83	1,650
Clay products			3 20,994,732		3 21,324,844
Clay, raw	short tons	301,429	2 577,721	293,794	2 707,908
Coal	do	(1)	(1)	(1)	(1)
Copper	pounds	52,107,171	6,826,039	46,864,913	6,654,818
Diatomaceous earth	short tons	59,226	614,984	71,074	877,503
Feldspar (crude)	long tons	8,027	62,344	6,077	49,881
Fuller's earth	short tons			(1)	(1)
Gems and precious stones			(4)		(4)
Gold	troy ounces	636,140	13,150,175	632,035	13,065,330
Gypsum	short tons	(1)	(1)	(1)	(1)
Iron ore	long tons	435	(1)	352	(1)
Lead	short tons	2,382	381,104	3,283	571,259
Lime	do	59,583	658,138	70,805	745,132
Lithium minerals	do	(1)	(1)		
Magnesite	do	67,240	901,700	64,600	872,100
Magnesium chloride (natural)	pounds	(1)	(1)	9,207,200	126,750
Magnesium sulphate (natural)	do	(1)	(1)	(1)	(1)
Manganese ore	long tons	850	(1)	869	17,525
Marl, calcareous	short tons	(1)	(1)	(1)	(1)
Mercury	flasks	7,966	547,185	7,614	632,936
Mineral waters	gallons sold	(4)	(4)	(4)	(4)
Natural gas	M cubic feet	189,692,000	35,949,000	187,789,000	32,587,000
Natural-gas gasoline	gallons	232,579,000	22,690,000	363,180,000	32,743,000
Peat	short tons	7,084	67,952	5,325	49,066
Pebbles for grinding	do	(1)	(1)	215	1,385
Petroleum	barrels	228,933,000	274,653,000	232,492,000	330,610,000
Platinum and allied metals	troy ounces	93	13,814	105	14,446
Potash (K_2O)	short tons	21,485	817,991	(1)	(1)
Pumice	do	(1)	(1)	(1)	(1)
Pyrites	long tons	(1)	(1)	(1)	(1)
Salt	short tons	268,112	1,361,166	292,480	1,420,924
Sand and gravel	do	11,132,930	6,653,536	14,077,849	8,752,528
Sand-lime brick	thousands	(1 3)	(1 3)	(1 3)	(1 3)
Shale oil	gallons	210,000	(5)	(5)	(5)
Silica (quartz)	short tons	6,993	31,424	5,602	40,773
Silver	troy ounces	3,555,133	2,381,939	3,054,416	2,119,765
Slate			(1)		
Sodium salts (carbonate, bicarbonate, sulphate, and trona) from natural sources	short tons	56,037	968,790	48,830	951,640
Stone	do	7,192,730	8,635,602	9,096,170	10,341,815
Talc and soapstone	do	16,335	247,799	14,883	194,975
Tungsten ore (60 per cent concentrates)	do	(1)	(1)	(1)	(1)
Zinc	do	1,530	198,900	5,745	873,182
Miscellaneous 7			3,961,966		5,188,658
Total value, eliminating duplications			428,175,652		496,923,376

1 Value included under "Miscellaneous."
2 Value not included in total value for State.
3 Figures obtained through cooperation with Bureau of the Census.
4 No canvass.
5 No data available.
6 Bureau of Mines not at liberty to publish figures.
7 Includes minerals indicated by "1" above.

Mineral production of Colorado in 1924 and 1925

Product		1924		1925	
		Quantity	Value	Quantity	Value
Arsenious oxide	short tons	(1)	(1)		
Cement	barrels	(1)	(1)	(1)	(1)
Clay products			[2] $3,954,639		[2] $4,126,945
Clay, raw	short tons	236,143	[3] 322,632	254,521	[3] 358,687
Coal	do	10,444,098	31,863,000	10,310,551	30,322,000
Coke	do	735,520	(1 3)	644,481	(1 3)
Copper	pounds	2,713,219	355,432	2,360,500	335,191
Feldspar (crude)	long tons	(1)	(1)	(1)	(1)
Ferro-alloys	do	(1 3)	(1 3)	(1 3)	(1 3)
Fluorspar	short tons	12,301	135,411	11,776	153,707
Gems and precious stones			(4)		(4)
Gold	troy ounces	415,692	8,593,116	349,607	7,227,022
Gypsum	short tons	(1)	(1)	(1)	(1)
Iron ore	long tons	4,702	(1)	8,642	(1)
Iron, pig	do	(1 3)	(1 3)	(1 3)	(1 3)
Lead	short tons	23,779	3,804,565	31,483	5,478,042
Lime	do	(1)	(1)	(1)	(1)
Manganese ore	long tons	5,338	48,042	743	5,127
Manganiferous ore:					
For fluxing	do	4,488	(1)	11,366	16,749
For other purposes	do	30,949	118,140	7,352	26,565
Mica, scrap	short tons	35	726	(1)	(1)
Mineral paints, zinc and lead pigments	do	16,622	[3] 2,162,959	16,301	[2] 2,007,495
Mineral waters	gallons sold	(4)	(4)	(4)	(4)
Molybdenum	pounds	(1)	(1)	(1)	(1)
Natural gas	M cubic feet	47,600	1,700	574,400	61,100
Natural-gas gasoline	gallons			35,000	4,000
Petroleum	barrels	445,000	490,000	1,226,000	1,810,000
Pyrite (radio crystals)	pounds	3,417	3,417	15	15
Sand and gravel	short tons	1,219,526	799,215	692,395	547,944
Silver	troy ounces	3,254,370	2,180,428	4,506,940	3,127,816
Stone	short tons	825,940	1,221,574	[5] 674,610	[5] 881,756
Tungsten ore (60 per cent concentrates)	do	(1)	(1)	201	(1)
Uranium and vanadium ores	do	(1)	(1)	(1)	(1)
Zinc	do	28,364	3,687,255	30,811	4,683,196
Miscellaneous [6]			17,700,798		15,275,625
Total value, eliminating duplications			61,487,882		63,148,959

[1] Value included under "Miscellaneous."
[2] Figures obtained through cooperation with Bureau of the Census.
[3] Value not included in total value for State.
[4] No canvass.
[5] Exclusive of basalt and marble, value for which is included under "Miscellaneous."
[6] Includes minerals indicated by "[1]" and "[5]" above.

Mineral production of Connecticut in 1924 and 1925

Product		1924		1925	
		Quantity	Value	Quantity	Value
Clay products			[1 2] $3,469,921		[1 2] $2,509,727
Clay, raw	short tons	661	[3] 7,601	416	[3] 6,503
Diatomaceous earth	do	(4)	(4)		
Feldspar (crude)	long tons	6,572	51,422	10,426	71,201
Lime	short tons	58,851	796,541	58,449	672,821
Mica:					
Scrap	do	(4)	(4)	(4)	(4)
Sheet	pounds			(4)	(4)
Mineral waters	gallons sold	(5)	(5)	(5)	(5)
Sand and gravel	short tons	1,191,421	1,175,757	1,065,132	463,807
Sand-lime brick	thousands	(1 4)	(1 4)	(1 4)	(1 4)
Silica (quartz)	short tons	1,308	8,829	595	3,960
Stone	do	[6] 1,849,670	[6] 2,251,566	1,830,210	2,655,339
Miscellaneous [7]			375,296		378,599
Total value, eliminating duplications			8,129,332		6,755,454

[1] Figures obtained through cooperation with Bureau of the Census.
[2] Exclusive of pottery, value for which is included under "Miscellaneous."
[3] Value not included in total value for State.
[4] Value included under "Miscellaneous."
[5] No canvass.
[6] Exclusive of limestone, value for which is included under "Miscellaneous."
[7] Includes minerals indicated by "[2]", "[4]", and "[6]" above.

Mineral production of Delaware in 1924 and 1925

Product	1924		1925	
	Quantity	Value	Quantity	Value
Clay products		[1] $235,555		[1] $271,701
Clay, raw short tons	5,710	[2] 66,254	5,583	[2] 65,705
Sand and gravel do	41,499	33,271	81,052	48,506
Stone do	93,130	243,279	118,940	219,054
Total value, eliminating duplications		512,105		539,261

[1] Figures obtained through cooperation with Bureau of the Census.
[2] Value not included in total value for State.

Mineral production of the District of Columbia in 1924 and 1925

Product	1924		1925	
	Quantity	Value	Quantity	Value
Clay products		[1] $175,252		[1 2] $131,080
Ferro-alloys long tons	([3 4])	([3 4])	([3 4])	([3 4])
Sand and gravel short tons	([3])	([3])	([3])	([3])
Sand-lime brick thousands	([1 3])	([1 3])	([1 3])	([1 3])
Stone short tons	8,370	15,760	([3])	([3])
Miscellaneous [5]		654,596		855,715
Total value, eliminating duplications		813,608		954,795

[1] Figures obtained through cooperation with Bureau of the Census.
[2] Exclusive of pottery, value for which is included under "Miscellaneous."
[3] Value included under "Miscellaneous."
[4] Value not included in total value for State.
[5] Includes minerals indicated by "[2]" and "[3]" above.

Mineral production of Florida in 1924 and 1925

Product	1924		1925	
	Quantity	Value	Quantity	Value
Clay products		[1 2] $239,073		[1 2] $317,339
Clay, raw short tons	50,247	[3] 692,657	53,009	[3] 711,567
Fuller's earth do	64,731	1,037,642	65,976	1,032,354
Lime do	([4])	([4])	17,793	186,650
Mineral waters gallons sold	([5])	([5])	([5])	([5])
Monazite pounds			2,000	[6] 120
Peat short tons	2,758	23,928	([4])	([4])
Phosphate rock long tons	2,432,581	8,017,476	2,929,964	8,789,070
Sand and gravel short tons	645,917	375,853	1,515,529	1,089,215
Sand-lime brick thousands	[1] 18,706	[1] 200,535	[1] 26,993	[1] 315,225
Stone short tons	2,973,360	2,942,778	4,026,790	4,687,107
Titanium minerals:				
Ilmenite do	4,769	[6] 76,300	5,566	[6] 89,000
Rutile do			46	[6] 11,000
Zircon do	281	[6] 39,340	624	[6] 87,360
Miscellaneous [7]		167,370		46,219
Total value, eliminating duplications		13,120,295		16,650,659

[1] Figures obtained through cooperation with Bureau of the Census.
[2] Exclusive of pottery, value for which is included under "Miscellaneous"
[3] Value not included in total value for State.
[4] Value included under "Miscellaneous."
[5] No canvass.
[6] Value estimated by the Bureau of Mines.
[7] Includes minerals indicated by "[2]" and "[4]" above.

Mineral production of Georgia in 1924 and 1925

Product	1924		1925	
	Quantity	Value	Quantity	Value
Asbestos short tons	(1)	(1)	(1)	(1)
Barite do	71,776	$574,208	65,936	$475,618
Bauxite long tons	16,140	101,780	18,220	(1)
Cement barrels	(1)	(1)	(1)	(1)
Clay products		[2] 6,032,950		[2] 6,369,227
Clay, raw short tons	347,218	[3] 1,214,570	330,063	[3] 1,255,166
Coal do	74,947	271,000	66,174	220,000
Coke do	8,081	[3] 71,355	4,925	[3] 38,464
Fuller's earth do	(1)	(1)	(1)	(1)
Gold troy ounces	32	655	468	9,683
Iron ore:				
Sold to furnaces long tons	112,059	285,128	79,488	231,683
Sold for paint do	482	(1)		
Lime short tons	(1)	(1)	(1)	(1)
Manganese ore long tons	1,093	18,304	1,649	20,281
Manganiferous ore do	20,535	90,242	35,387	156,612
Mica:				
Scrap short tons	(1)	(1)	(1)	(1)
Sheet pounds	(1)	(1)	(1)	(1)
Mineral waters gallons sold	(4)	(4)	(4)	(4)
Sand and gravel short tons	874,527	242,754	741,020	303,441
Silver troy ounces	5	3	46	32
Slate		(1)		(1)
Stone short tons	565,630	4,472,628	734,140	4,971,493
Talc do	1,885	30,548	5,022	76,028
Miscellaneous [5]		2,826,410		3,669,643
Total value, eliminating duplications		14,946,610		16,503,741

[1] Value included under "Miscellaneous."
[2] Figures obtained through cooperation with Bureau of the Census.
[3] Value not included in total value for State.
[4] No canvass.
[5] Includes minerals indicated by "1" above.

Mineral production of Idaho in 1924 and 1925

Product	1924		1925	
	Quantity	Value	Quantity	Value
Asbestos short tons			(1)	(1)
Clay products		[2] $205,172		[2] $184,007
Clay, raw short tons	570	[3] 5,550	214	[3] 2,085
Coal do	(1)	(1)	(1)	(1)
Copper pounds	2,738,824	358,786	3,297,443	468,237
Gems and precious stones		(4)		(4)
Gold troy ounces	26,922	556,523	20,887	431,771
Lead short tons	124,475	19,916,023	126,521	22,014,636
Lime do	(1)	(1)	(1)	(1)
Mercury flasks	(1)	(1)	(1)	(1)
Phosphate rock long tons	36,829	187,319	65,934	289,498
Salt short tons	33	350	(1)	(1)
Sand and gravel do	113,028	33,734	53,180	20,142
Silver troy ounces	7,793,154	5,221,413	7,743,439	5,373,947
Stone short tons	211,030	318,588	[5] 317,470	[5] 424,008
Zinc do	7,670	997,132	15,619	2,374,030
Miscellaneous [6]		36,583		30,890
Total value, eliminating duplications		27,831,623		31,611,166

[1] Value included under "Miscellaneous."
[2] Figures obtained through cooperation with Bureau of the Census.
[3] Value not included in total value for State.
[4] No canvass.
[5] Exclusive of unclassified stone, value for which is included under "Miscellaneous."
[6] Includes minerals indicated by "1" and "5" above.

Mineral production of Illinois in 1924 and 1925

Product		1924		1925	
		Quantity	Value	Quantity	Value
Cement	barrels	[1] 6,955,455	[1] $12,026,310	[1] 6,749,532	[1] $11,481,576
Clay products			[2] 33,591,368		[2] 36,763,980
Clay, raw	short tons	178,071	[3] 343,977	218,264	[3] 384,199
Coal	do	68,323,281	155,260,000	66,909,359	146,492,000
Coke	do	2,355,474	[3] 20,187,519	3,011,497	[3] 22,568,845
Fluorspar	do	62,067	1,288,310	54,428	1,024,516
Fuller's earth	do	[4]	[4]	[4]	[4]
Iron, pig	long tons	2,695,961	[3] 59,299,519	3,600,484	[3] 74,937,781
Lead	short tons	1,464	234,240	1,001	174,174
Lime	do	89,132	934,199	96,066	928,632
Marl, calcareous	do			[4]	[4]
Mineral paints, zinc and lead pigments	do	12,447	[3] 1,851,951	16,696	[2] 2,426,352
Mineral waters	gallons sold	[5]	[5]	[5]	[5]
Natural gas	M cubic feet	4,072,000	759,000	4,165,000	865,000
Natural-gas gasoline	gallons	9,091,000	795,000	9,874,000	1,102,000
Peat	short tons	[4]	[4]	[4]	[4]
Petroleum	barrels	8,681,000	14,220,000	7,863,000	15,235,000
Sand and gravel	short tons	12,313,979	7,281,766	14,954,536	8,140,090
Sand and sandstone (finely ground)	do	88,562	590,167	87,860	529,934
Silver	troy ounces	8,891	5,957	3,000	2,082
Stone	short tons	8,640,960	7,959,934	8,576,830	7,722,683
Sulphuric acid (60° Baumé) [6]	do	219,469	[3] 1,986,000	248,965	[3] 2,149,000
Tripoli	do	13,466	116,188	11,809	143,859
Zinc	do	2,512	326,560	2,724	414,048
Miscellaneous [7]			407,028		639,030
Total value, eliminating duplications			235,796,027		231,658,604

[1] Exclusive of natural cement, value for which is included under "Miscellaneous."
[2] Figures obtained through cooperation with Bureau of the Census.
[3] Value not included in total value for State.
[4] Value included under "Miscellaneous."
[5] No canvass.
[6] From zinc smelting.
[7] Includes minerals indicated by "[1]" and "[4]" above.

Mineral production of Indiana in 1924 and 1925

Product		1924		1925	
		Quantity	Value	Quantity	Value
Cement	barrels	[1]	[1]	[1]	[1]
Clay products			[2] $16,368,139		[2] $18,037,932
Clay, raw	short tons	102,242	[3] 122,162	188,491	[3] 204,962
Coal	do	21,480,213	46,453,000	21,224,966	42,884,000
Coke	do	4,272,435	[3] 30,394,497	5,141,940	[3] 36,635,104
Iron, pig	long tons	2,571,411	[3] 52,507,720	3,350,747	[3] 64,807,575
Lime	short tons	116,927	991,003	127,878	1,067,040
Mineral paints, zinc and lead pigments	do	[1 3]	[1 3]	[1 3]	[1 3]
Mineral waters	gallons sold	[4]	[4]	[4]	[4]
Natural gas	M cubic feet	998,000	494,000	1,168,000	504,000
Peat	short tons	[1]	[1]	4,000	28,000
Petroleum	barrels	935,000	1,720,000	829,000	1,615,000
Potash (K_2O)	short tons	72	4,800		
Rubbing stones, scythestones, and whetstones	short tons	304	38,002	275	38,872
Sand and gravel	do	12,933,373	5,070,339	12,054,740	5,275,743
Sand-lime brick	thousands	[1 2]	[1 2]	[1 2]	[1 2]
Stone	short tons	[5] 3,824,440	[5] 17,269,407	[5] 4,455,310	[5] 18,140,974
Sulphuric acid [6]	do	[1 3]	[1 3]	[1 3]	[1 3]
Miscellaneous [7]			25,493,371		26,199,207
Total value, eliminating duplications			112,299,075		111,833,732

[1] Value included under "Miscellaneous."
[2] Figures obtained through cooperation with Bureau of the Census.
[3] Value not included in total value for State.
[4] No canvass.
[5] Exclusive of sandstone, value for which is included under "Miscellaneous."
[6] From zinc smelting.
[7] Includes minerals indicated by "[1]" and "[4]" above.

Mineral production of Iowa in 1924 and 1925

Product		1924		1925	
		Quantity	Value	Quantity	Value
Cement	barrels	4, 881, 613	$8, 811, 587	4, 856, 849	$8, 674, 563
Clay products			[1 2] 5, 669, 810		[1 2] 5, 703, 537
Clay, raw	short tons	27, 188	[3] 27, 547	2, 813	[3] 3, 539
Coal	do	5, 468, 450	18, 097, 000	4, 714, 843	14, 807, 000
Ferro-alloys	long tons	([3 4])	([3 4])	([3 4])	([3 4])
Gypsum	short tons	727, 385	5, 657, 339	800, 167	6, 734, 271
Lime	do	([4])	([4])	([4])	([4])
Mineral waters	gallons sold	([5])	([5])	([5])	([5])
Natural gas	M cubic feet	([4])	([4])	([4])	([4])
Sand and gravel	short tons	2, 427, 626	1, 473, 066	3, 297, 785	1, 546, 900
Sand-lime brick	thousands			([1 4])	([1 4])
Stone	short tons	607, 530	712, 540	805, 140	870, 230
Miscellaneous [6]			630, 827		1, 090, 659
Total value, eliminating duplications			40, 459, 869		38, 420, 203

[1] Figures obtained through cooperation with Bureau of the Census.
[2] Exclusive of pottery, value for which is included under "Miscellaneous."
[3] Value not included in total value for State.
[4] Value included under "Miscellaneous."
[5] No canvass.
[6] Includes minerals indicated by "[2]" and "[4]" above.

Mineral production of Kansas in 1924 and 1925

Product		1924		1925	
		Quantity	Value	Quantity	Value
Cement	barrels	[1] 5, 809, 646	[1] $9, 900, 547	[1] 6, 513, 297	[1] $10, 861, 506
Chats	short tons	346, 800	55, 000	208, 060	28, 969
Clay products			[2] 4, 024, 535		[2 3] 4, 345, 971
Coal	short tons	4, 247, 733	12, 854, 000	4, 524, 251	13, 013, 000
Gypsum	do	141, 908	894, 262	166, 952	1, 009, 510
Lead	do	18, 560	2, 969, 600	22, 775	3, 962, 850
Mineral paints, zinc and lead pigments	do	([4 5])	([4 5])	([4 5])	([4 5])
Mineral waters	gallons sold	([6])	([6])	([6])	([6])
Natural gas	M cubic feet	25, 580, 000	10, 087, 000	26, 917, 000	9, 991, 000
Natural-gas gasoline	gallons	11, 658, 000	913, 000	19, 592, 000	2, 223, 000
Petroleum	barrels	28, 836, 000	44, 400, 000	38, 357, 000	74, 410, 000
Pumice	short tons	39, 489	148, 177	35, 385	122, 349
Salt	do	794, 303	2, 781, 217	812, 540	2, 494, 423
Sand and gravel	do	1, 882, 968	1, 223, 016	2, 198, 870	1, 303, 060
Stone	do	[7] 766, 120	[7] 960, 626	[7] 705, 780	[7] 958, 779
Zinc	do	105, 392	13, 700, 960	118, 778	18, 054, 256
Miscellaneous [8]			1, 685, 092		1, 927, 967
Total value, eliminating duplications			105, 005, 476		142, 944, 214

[1] Exclusive of natural cement, value for which is included under "Miscellaneous."
[2] Figures obtained through cooperation with Bureau of the Census.
[3] Exclusive of pottery, value for which is included under "Miscellaneous."
[4] Value included under "Miscellaneous."
[5] Value not included in total value for State.
[6] No canvass.
[7] Exclusive of sandstone, value for which is included under "Miscellaneous."
[8] Includes minerals indicated by "[1]", "[3]", "[4]", and "[7]" above.

Mineral production of Kentucky in 1924 and 1925

Product		1924		1925	
		Quantity	Value	Quantity	Value
Asphalt (native)	short tons	274,743	$2,386,557	286,850	$2,493,360
Cement	barrels	[1]	[1]	[1]	[1]
Clay products			[2] 7,519,239		[2] 7,853,355
Clay, raw	short tons	115,644	[3] 500,349	121,917	[3] 548,015
Coal	do	45,147,204	84,733,000	55,068,670	94,825,000
Coke	do	[1 3]	[1 3]	[1 3]	[1 3]
Fluorspar	do	47,847	988,940	44,826	833,794
Iron, pig	long tons	99,055	[1 3]	153,935	[1 3]
Lead	short tons	175	28,000	152	26,448
Lime	do	8,091	58,228	9,433	71,300
Mineral waters	gallons sold	[4]	[4]	[4]	[4]
Natural gas	M cubic feet	12,875,000	3,432,000	10,770,000	3,213,000
Natural-gas gasoline	gallons	7,274,000	769,000	7,685,000	884,000
Petroleum	barrels	7,407,000	14,592,000	6,759,000	15,682,000
Phosphate rock	long tons	[1]	[1]	[1]	[1]
Sand and gravel	short tons	3,442,457	1,629,973	2,402,982	1,770,458
Scythestones and whetstones	do	[1]	[1]	[1]	[1]
Stone	do	2,173,700	2,786,249	1,703,010	2,127,504
Zinc	do	492	63,960	429	65,208
Miscellaneous [5]			5,833,023		7,718,442
Total value, eliminating duplications			120,510,775		131,370,840

[1] Value included under "Miscellaneous."
[2] Figures obtained through cooperation with Bureau of the Census.
[3] Value not included in total value for State.
[4] No canvass.
[5] Includes minerals indicated by "[1]" above.

Mineral production of Louisiana in 1924 and 1925

Product		1924		1925	
		Quantity	Value	Quantity	Value
Clay products			[1 2] $324,064		[1 2] $674,167
Mineral waters	gallons sold	[3]	[3]	[3]	[3]
Natural gas	M cubic feet	160,945,000	7,626,000	152,620,000	8,125,000
Natural-gas gasoline	gallons	48,098,000	3,887,000	43,489,000	4,216,000
Petroleum	barrels	21,124,000	30,340,000	20,272,000	32,500,000
Salt	short tons	383,104	2,182,797	500,350	2,218,265
Sand and gravel	do	3,132,447	2,287,495	2,807,761	1,766,452
Sand-lime brick	thousands	[1 4]	[1 4]	[1 4]	[1 4]
Stone	short tons	[4]	[4]	[4]	[4]
Sulphur	long tons	[4]	[4]	[4]	[4]
Miscellaneous [5]			10,283,325		11,004,007
Total value, eliminating duplications			56,930,681		60,503,891

[1] Figures obtained through cooperation with Bureau of the Census.
[2] Exclusive of pottery, value for which is included under "Miscellaneous."
[3] No canvass.
[4] Value included under "Miscellaneous."
[5] Includes minerals indicated by "[2]" and "[4]" above.

Mineral production of Maine in 1924 and 1925

Product	1924		1925	
	Quantity	Value	Quantity	Value
Clay products		[1] $707,044		[1] $625,969
Clay, raw short tons			([2] [3])	([2] [3])
Feldspar (crude) long tons	29,912	271,354	28,404	256,731
Gems and precious stones		([4])		([4])
Lime short tons	125,688	1,809,929	115,571	1,291,812
Mica:				
Scrap do			([2])	([2])
Sheet pounds			([2])	([2])
Mineral waters gallons sold	([4])	([4])	([4])	([4])
Peat short tons	([2])	([2])	([2])	([2])
Sand and gravel do	303,398	149,454	407,760	155,014
Silica (quartz) do			([2])	([2])
Slate		667,541		604,062
Stone short tons	[5] 263,720	[5] 2,411,938	[5] 361,570	[5] 2,870,442
Miscellaneous [6]		17,900		38,942
Total value, eliminating duplications		6,035,160		5,838,718

[1] Figures obtained through cooperation with Bureau of the Census.
[2] Value included under "Miscellaneous."
[3] Value not included in total value for State.
[4] No canvass.
[5] Exclusive of unclassified stone, value for which is included under "Miscellaneous."
[6] Includes minerals indicated by "[2]" and "[5]" above.

Mineral production of Maryland in 1924 and 1925

Product	1924		1925	
	Quantity	Value	Quantity	Value
Asbestos short tons	([1])	([1])	([1])	([1])
Briquets, fuel do			([1] [2])	([1] [2])
Cement barrels	([1])	([1])	([1])	([1])
Chromite long tons			25	$455
Clay products		[3] $3,973,074		[3] [4] 2,868,452
Clay, raw short tons	86,342	[2] 165,931	91,032	[2] 168,606
Coal do	2,133,703	4,629,000	2,694,572	5,312,000
Coke do	810,118	([1] [2])	1,019,209	([1] [2])
Diatomaceous earth do	([1])	([1])		
Feldspar (crude) long tons	4,854	25,020	4,554	26,438
Ferro-alloys do	([1] [2])	([1] [2])	20,360	([1] [2])
Iron, pig do	539,188	([1] [2])	693,523	([1] [2])
Lime short tons	56,178	470,105	64,518	524,100
Marl, calcareous do	([1])	([1])	([1])	([1])
Mineral waters gallons sold	([5])	([5])	([5])	([5])
Potash (K_2O) short tons	315	19,055	4,509	225,482
Sand and gravel do	2,418,137	2,368,813	3,619,534	3,500,130
Silica (quartz) do	2,353	34,605	5,011	52,849
Slate		117,137		210,148
Stone short tons	[6] 1,100,410	[6] 1,913,395	[6] 1,136,880	[6] 1,853,881
Talc do	3,015	29,767	2,718	35,488
Miscellaneous [7]		22,919,163		27,782,743
Total value, eliminating duplications		18,506,867		21,557,810

[1] Value included under "Miscellaneous."
[2] Value not included in total value for State.
[3] Figures obtained through cooperation with Bureau of the Census.
[4] Exclusive of pottery, value for which is included under "Miscellaneous."
[5] No canvass.
[6] Exclusive of marble, value for which is included under "Miscellaneous."
[7] Includes minerals indicated by "[1]", "[4]", and "[6]" above.

Mineral production of Massachusetts in 1924 and 1925

Product	1924		1925	
	Quantity	Value	Quantity	Value
Clay products		[1] $3,859,253		[1] $3,789,164
Clay, raw short tons	2,234	[2] 33,796	2,270	[2] 31,538
Coke do	397,640	([2] [3])	535,302	([2] [3])
Fuller's earth do	([3])	([3])	([3])	([3])
Iron, pig long tons	50	([2] [3])		
Lead short tons	([4])	([4])		
Lime do	194,402	2,693,028	197,732	2,610,279
Manganese ore long tons			([3])	([3])
Manganiferous ore do			([3])	([3])
Mineral waters gallons sold	([5])	([5])	([5])	([5])
Sand and gravel short tons	2,904,911	2,496,148	3,349,091	3,116,323
Sand-lime brick thousands	([1] [3])	([1] [3])	([1] [3])	([1] [3])
Silica (quartz) short tons	([3])	([3])	([3])	([3])
Stone do	[6] 1,936,520	[6] 6,063,048	[6] 2,209,560	[6] 6,640,333
Miscellaneous [7]		4,309,481		5,443,850
Total value, eliminating duplications		15,725,882		16,831,529

[1] Figures obtained through cooperation with Bureau of the Census.
[2] Value not included in total value for State.
[3] Value included under "Miscellaneous."
[4] It is stated that a few tons of lead ore was mined and was treated at a small smelter owned by the mine operators. No figures are available.
[5] No canvass.
[6] Exclusive of sandstone, value for which is included under "Miscellaneous."
[7] Includes minerals indicated by "[3]" and "[6]" above.

Mineral production of Michigan in 1924 and 1925

Product	1924		1925	
	Quantity	Value	Quantity	Value
Bromine pounds	1,866,753	$552,055	([1])	([1])
Calcium chloride short tons	50,269	1,097,377	59,510	$1,316,603
Cement barrels	8,991,270	16,405,761	10,073,453	17,511,908
Clay products		[2] 10,246,953		[2] 7,396,071
Clay, raw short tons	9,332	[3] 14,041	3,953	[3] 7,405
Coal do	831,020	3,602,000	808,233	3,391,000
Coke do	1,770,547	[3] 11,914,028	1,751,118	[3] 11,708,519
Copper pounds	135,662,605	17,771,801	155,157,488	22,032,363
Gems and precious stones		([4])		([4])
Graphite, amorphous short tons	([1])	([1])	([1])	([1])
Grindstones do	([1])	([1])	([1])	([1])
Gypsum do	577,526	5,950,822	649,053	5,447,294
Iron ore:				
Sold to furnaces long tons	11,248,641	35,605,902	15,254,003	40,926,315
Sold for paint do	2,296	([1])	4,604	([1])
Iron, pig do	650,333	[3] 15,225,990	831,435	[3] 18,452,346
Lime short tons	73,096	702,072	95,036	909,952
Magnesium pounds	([1] [3])	([1] [3])	([1] [3])	([1] [3])
Magnesium chloride (natural) do	([1])	([1])	([1])	([1])
Magnesium sulphate (natural) do	([1])	([1])	([1])	([1])
Manganiferous ore long tons	90,495	([1])	98,753	([1])
Marl, calcareous short tons	2,500	3,120	([1])	([1])
Mineral waters gallons sold	([4])	([4])	([4])	([4])
Natural gas M cubic feet	600	300	400	200
Peat short tons	([1])	([1])	800	20,000
Petroleum barrels			4,000	10,000
Salt short tons	1,918,463	7,864,838	2,172,600	7,710,331
Sand and gravel do	11,381,084	5,975,757	10,878,375	5,684,471
Sand-lime brick thousands	[2] 89,239	[2] 1,052,435	[2] 97,828	[2] 1,175,776
Silver troy ounces	130,381	87,355	139,499	96,812
Stone short tons	10,023,440	5,943,680	11,598,680	6,671,804
Miscellaneous [5]		1,444,738		2,031,191
Total value, eliminating duplications		114,239,386		122,212,254

[1] Value included under "Miscellaneous."
[2] Figures obtained through cooperation with Bureau of the Census.
[3] Value not included in total value for State.
[4] No canvass.
[5] Includes minerals indicated by "[1]" above.

Mineral production of Minnesota in 1924 and 1925

Product	1924		1925	
	Quantity	Value	Quantity	Value
Cement ..... barrels	(1)	(1)	(1)	(1)
Clay products		[2 3] $1,675,204		[3] $1,764,860
Clay, raw ..... short tons	21,545	[4] 34,705	(1 4)	(1 4)
Coke ..... do	514,764	[4] 4,903,891	518,355	[4] 4,992,024
Flint lining for tube mills ..... do	(1)	(1)	(1)	(1)
Gems and precious stones		(5)		(5)
Iron ore:				
Sold to furnaces ..... long tons	31,076,114	93,311,092	38,022,237	96,083,485
Sold for paint ..... do			84	(1)
Iron, pig ..... do	189,033	(1 4)	276,240	(1 4)
Lime ..... short tons	25,764	319,066	(1)	(1)
Manganiferous ore ..... long tons	521,442	1,409,483	819,074	1,761,422
Marl, calcareous ..... short tons	(1)	(1)		
Mineral waters ..... gallons sold	(5)	(5)	(5)	(5)
Pebbles for grinding ..... short tons	(1)	(1)	(1)	(1)
Sand and gravel ..... do	3,000,007	1,883,029	3,015,793	2,046,250
Sand-lime brick ..... thousands	[2] 16,337	[2] 103,052	(1 2)	(1 2)
Stone ..... short tons	804,280	4,220,658	753,740	3,784,252
Miscellaneous [6]		9,099,237		10,511,439
Total value, eliminating duplications		107,844,680		110,252,956

[1] Value included under "Miscellaneous."
[2] Figures obtained through cooperation with Bureau of the Census.
[3] Exclusive of pottery, value for which is included under "Miscellaneous."
[4] Value not included in total value for State.
[5] No canvass.
[6] Includes minerals indicated by "1" and "3" above.

Mineral production of Mississippi in 1924 and 1925

Product	1924		1925	
	Quantity	Value	Quantity	Value
Clay products		[1] $955,328		[1] $1,050,241
Clay, raw ..... short tons	2,195	[2] 7,619	2,229	[2] 11,090
Mineral waters ..... gallons sold	(3)	(3)	(3)	(3)
Sand and gravel ..... short tons	2,442,911	1,134,288	2,531,515	1,120,709
Stone ..... do	(4)	(4)	(4)	(4)
Miscellaneous		806		995
Total value, eliminating duplications		2,090,422		2,171,945

[1] Figures obtained through cooperation with Bureau of the Census.
[2] Value not included in total value for State.
[3] No canvass.
[4] Value included under "Miscellaneous."

Mineral production of Missouri in 1924 and 1925

Product	1924		1925	
	Quantity	Value	Quantity	Value
Asphalt (native)—short tons	300	$3,150		
Barite—do	77,189	604,390	101,056	$794,927
Briquets, fuel—do	[1 2]	[1 2]	[1 2]	[1 2]
Cement—barrels	7,711,206	13,515,267	8,168,165	14,155,795
Chats—short tons	2,081,075	312,200	1,596,409	399,102
Clay products		[3] 16,338,161		[3 4] 17,521,866
Clay, raw—short tons	459,570	[2] 1,441,457	453,006	[2] 1,463,880
Coal—do	2,480,880	8,154,000	2,694,215	8,281,000
Coke—do	[1 2]	[1 2]	[1 2]	[1 2]
Copper—pounds	182,811	23,948	12,100	1,718
Iron ore—long tons	79,847	405,622	40,043	[1]
Iron, pig—do	21,371	[1 2]	3,758	[1 2]
Lead—short tons	189,929	30,388,640	211,566	36,812,484
Lime—do	243,465	2,354,175	273,348	2,610,954
Mineral paints, zinc and lead pigments—do	[1 2]	[1 2]	[1 2]	[1 2]
Mineral waters—gallons sold	[5]	[5]	[5]	[5]
Natural gas—M cubic feet	71,000	61,000	34,000	29,700
Sand and gravel—short tons	4,081,200	2,053,436	5,523,605	3,595,187
Sand and sandstone (finely ground)—do			[1]	[1]
Silver—troy ounces	103,694	69,475	83,340	57,838
Stone—short tons	[6] 2,320,010	[6] 4,961,333	[6] 2,796,510	[6] 5,662,835
Tripoli—do	[1]	[1]	[1]	[1]
Zinc—do	12,920	1,679,600	14,794	2,248,688
Miscellaneous [7]		4,880,982		4,654,101
Total value, eliminating duplications		81,054,122		92,548,473

[1] Value included under "Miscellaneous."
[2] Value not included in total value for State.
[3] Figures obtained through cooperation with Bureau of the Census.
[4] Exclusive of pottery, value for which is included under "Miscellaneous."
[5] No canvass.
[6] Exclusive of basalt in 1924 and of unclassified stone in 1925, value for which is included under "Miscellaneous."
[7] Includes minerals indicated by "[1]", "[4]", and "[6]" above.

Mineral production of Montana in 1924 and 1925

Product	1924		1925	
	Quantity	Value	Quantity	Value
Arsenious oxide—short tons	7,535	$602,818	6,019	$361,140
Asbestos—do	1	190		
Cement—barrels	[1]	[1]	[1]	[1]
Clay products		[2] 181,057		[2] 271,187
Clay, raw—short tons	10,272	[3] 15,103	13,526	[3] 28,299
Coal—do	2,905,365	8,596,000	3,043,686	7,879,000
Copper—pounds	249,152,062	32,638,920	268,910,847	38,185,340
Ferro-alloys—long tons	[1 3]	[1 3]	[1 3]	[1 3]
Gems and precious stones		[4]		[4]
Gold—troy ounces	97,854	2,022,825	82,123	1,697,630
Graphite, crystalline—pounds			[1]	[1]
Gypsum—short tons	[1]	[1]	[1]	[1]
Iron ore—long tons	3,913	10,846	3,672	10,244
Lead—short tons	19,738	3,158,081	18,765	3,265,166
Lime—do	2,374	25,316	6,269	44,992
Manganese ore:				
For fluxing—long tons	1,833	[1]		
For other purposes—do	35,445	939,919	76,188	1,411,001
Manganiferous ore (for fluxing)—do	3,774	[1]		
Mineral waters—gallons sold	[4]	[4]	[4]	[4]
Natural gas—M cubic feet	1,071,000	272,350	1,496,000	350,000
Petroleum—barrels	2,815,000	3,754,000	4,091,000	6,420,000
Phosphate rock—long tons	491	1,650		
Sand and gravel—short tons	597,161	172,151	1,024,983	293,397
Silver—troy ounces	13,289,303	8,903,833	13,158,191	9,131,784
Stone—short tons	251,730	235,580	[5] 237,860	[5] 222,566
Sulphuric acid (60° Baumé)[6]—do	46,397	[1 3]	52,304	[1 3]
Zinc—do	64,238	8,350,889	57,658	8,764,086
Miscellaneous [7]		1,230,603		1,473,233
Total value, eliminating duplications		70,631,806		79,261,284

[1] Value included under "Miscellaneous."
[2] Figures obtained through cooperation with Bureau of the Census.
[3] Value not included in total value for State.
[4] No canvass.
[5] Exclusive of basalt and unclassified stone, value for which is included under "Miscellaneous."
[6] From copper smelting.
[7] Includes minerals indicated by "[1]" and "[5]" above.

Mineral production of Nebraska in 1924 and 1925

Product		1924		1925	
		Quantity	Value	Quantity	Value
Cement	barrels	(1)	(1)	(1)	(1)
Clay products			[2 3] $796,725		[2 3] $964,258
Clay, raw	short tons	13,092	[4] 14,172	29,169	[4] 30,589
Coal	do	(1)	(1)		
Mineral waters	gallons sold	(5)	(5)	(5)	(5)
Pumice	short tons	3,577	34,028	4,657	46,564
Sand and gravel	do	2,098,400	1,099,499	2,651,473	1,027,096
Stone	do	222,030	285,977	135,910	225,669
Miscellaneous [6]			993,196		1,094,998
Total value, eliminating duplications			3,209,425		3,358,585

[1] Value included under "Miscellaneous."
[2] Figures obtained through cooperation with Bureau of the Census.
[3] Exclusive of pottery, value for which is included under "Miscellaneous."
[4] Value not included in total value for State.
[5] No canvass.
[6] Includes minerals indicated by "[1]" and "[3]" above.

Mineral production of Nevada in 1924 and 1925

Product		1924		1925	
		Quantity	Value	Quantity	Value
Antimony ore	short tons			(1)	(1)
Arsenious oxide	do	3,196	$255,664		
Barite	do	(1)	(1)	(1)	(1)
Borates	do	(1)	(1)	(1)	(1)
Clay products			(1 2)		(1 2)
Clay, raw	short tons	3,360	[3] 35,806	1,719	[3] $17,695
Copper	pounds	73,805,323	9,668,497	79,300,224	11,260,632
Diatomaceous earth	short tons	332	5,570	510	13,800
Fuller's earth	do			(1)	(1)
Gems and precious stones			(4)		(4)
Gold	troy ounces	217,963	4,505,686	187,105	3,867,798
Graphite, amorphous	short tons	(1)	(1)	(1)	(1)
Gypsum	do	365,714	2,063,089	350,130	1,721,809
Lead	do	10,030	1,604,803	12,238	2,129,451
Lime	do	(1)	(1)	(1)	(1)
Manganese ore	long tons	1,310	13,579	850	(1)
Manganiferous ore:					
For fluxing	do	16,710	(1)	16,168	(1)
For other purposes	do	2,591	15,997	6,659	(1)
Mercury	flasks	(1)	(1)	539	44,806
Mica, sheet	pounds			(1)	(1)
Mineral waters	gallons sold	(4)	(4)	(4)	(4)
Salt	short tons			(1)	(1)
Sand and gravel	do	742,808	152,645	509,998	174,527
Shale oil	gallons	390,000	(5)		
Silica (quartz)	short tons	2,500	12,000	2,419	12,264
Silver	troy ounces	9,411,379	6,305,624	7,096,618	4,925,053
Sodium sulphate from natural sources	short tons	(1)	(1)	(1)	(1)
Stone	do	202,270	167,324	102,710	127,359
Sulphur	long tons	(1)	(1)	(1)	(1)
Tungsten ore (60 per cent concentrates)	short tons	(1)	(1)	407	257,600
Zinc	do	5,501	715,189	7,411	1,126,418
Miscellaneous [6]			740,276		808,384
Total value, eliminating duplications			26,225,943		26,469,901

[1] Value included under "Miscellaneous."
[2] Figures obtained through cooperation with Bureau of the Census
[3] Value not included in total value for State.
[4] No canvass.
[5] No data available.
[6] Includes minerals indicated by "[1]" above.

Mineral production of New Hampshire in 1924 and 1925

Product	1924		1925	
	Quantity	Value	Quantity	Value
Clay products		[1] $868,444		[1] $828,541
Diatomaceous earth, short tons	[2]	[2]	2	100
Feldspar (crude), long tons	39,425	324,638	38,366	278,736
Garnet, abrasive, short tons	[2]	[2]	[2]	[2]
Mica:				
Scrap, do	492	9,498	1,953	47,525
Sheet, pounds	744,133	88,737	1,120,857	198,853
Millstones		1,595		2,908
Mineral waters, gallons sold	[3]	[3]	[3]	[3]
Peat, short tons	21	2,800		
Sand and gravel, do	495,602	416,014	424,330	316,248
Scythestones, do	[2]	[2]	[2]	[2]
Silica (quartz), do	[2]	[2]	[2]	[2]
Stone, do	[4] 93,340	[4] 1,556,598	[4] 130,120	[4] 1,712,138
Miscellaneous [5]		109,841		79,783
Total value, eliminating duplications		3,378,165		3,464,837

[1] Figures obtained through cooperation with Bureau of the Census.
[2] Value included under "Miscellaneous."
[3] No canvass.
[4] Exclusive of unclassified stone, value for which is included under "Miscellaneous."
[5] Includes minerals indicated by "[2]" and "[4]" above.

Mineral production of New Jersey in 1924 and 1925

Product	1924		1925	
	Quantity	Value	Quantity	Value
Briquets, fuel, short tons	([1] [2])	([1] [2])	([1] [2])	([1] [2])
Cement, barrels	([1])	([1])	([1])	([1])
Clay products		[3] $46,414,167		[3] $46,010,624
Clay, raw, short tons	352,734	[2] 1,486,032	343,203	[2] 1,418,979
Coke, do	869,120	([1] [2])	903,997	([1] [2])
Ferro-alloys, long tons	([1] [2])	([1] [2])	([1] [2])	([1] [2])
Iron ore:				
Sold to furnaces, do	101,123	420,488	164,523	678,021
Sold for paint, do	208	([1])	952	([1])
Iron, pig, do	([1] [2])	([1] [2])	([1] [2])	([1] [2])
Lime, short tons	204	1,516	([1])	([1])
Manganiferous residuum [4], long tons	119,457	([1])	147,937	([1])
Marl, greensand, short tons	14,055	151,205	12,728	179,788
Mineral waters, gallons sold	([5])	([5])	([5])	([5])
Peat, short tons	23,523	172,863	31,530	160,695
Sand and gravel, do	3,968,361	3,345,764	4,935,934	3,680,064
Sand and sandstone (finely ground), do	([1])	([1])		
Sand-lime brick, thousands	([1] [3])	([1] [3])	([1] [3])	([1] [3])
Stone, short tons	2,149,270	3,326,298	2,335,820	3,656,943
Talc, do	([1])	([1])	([1])	([1])
Zinc, do	84,370	([1])	89,261	([1])
Miscellaneous [6]		31,270,680		30,752,288
Total value, eliminating duplications		75,271,009		76,761,313

[1] Value included under "Miscellaneous."
[2] Value not included in total value for State.
[3] Figures obtained through cooperation with Bureau of the Census.
[4] Ore mined in New Jersey; smelted in Pennsylvania.
[5] No canvass.
[6] Includes minerals indicated by "[1]" above.

Mineral production of New Mexico in 1924 and 1925

Product		1924		1925	
		Quantity	Value	Quantity	Value
Arsenious oxide	short tons	[1]	[1]		
Clay products			[2] $18,611		[2] $144,639
Clay, raw	short tons	3,596	[3] 13,603	4,753	[3] 12,657
Coal	do	2,786,063	9,774,000	2,556,851	8,611,000
Coke	do	83,070	[1 3]	[1 3]	[1 3]
Copper	pounds	74,691,436	9,784,578	76,427,825	10,852,751
Fluorspar	short tons	2,580	35,178	2,639	40,325
Gems and precious stones			[4]		[4]
Gold	troy ounces	24,804	512,735	26,561	549,073
Gypsum	short tons	[1]	[1]	[1]	[1]
Iron ore	long tons	189,371	[1]	172,959	[1]
Lead	short tons	1,817	290,761	3,210	558,545
Lime	do	2,389	23,975	1,329	14,010
Lithium minerals	do	[1]	[1]	[1]	[1]
Manganese ore	long tons	775	[1]	1,588	[1]
Manganiferous ore	do	23,246	[1]	40,848	153,251
Mica:					
Scrap	short tons	178	3,248	920	14,580
Sheet	pounds	29,803	6,583	34,486	7,531
Mineral waters	gallons sold	[4]	[4]	[4]	[4]
Molybdenum	pounds	[1]	[1]	[1]	[1]
Natural gas	M cubic feet			[1]	[1]
Petroleum	barrels	98,000	127,000	1,060,000	1,815,000
Salt	short tons	1,700	17,000	[1]	[1]
Sand and gravel	do	526,787	267,110	141,013	107,204
Silver	troy ounces	795,070	532,697	735,124	510,176
Stone	short tons	654,610	432,023	121,950	92,034
Zinc	do	10,380	1,349,348	9,246	1,405,415
Miscellaneous [5]			1,438,961		1,249,923
Total value, eliminating duplications			23,913,528		25,548,804

[1] Value included under "Miscellaneous."
[2] Figures obtained through cooperation with Bureau of the Census.
[3] Value not included in total value for State.
[4] No canvass.
[5] Includes minerals indicated by "[1]" above.

Mineral production of New York in 1924 and 1925

Product		1924		1925	
		Quantity	Value	Quantity	Value
Aluminum	pounds	(1 2)	(1 2)	(1 2)	(1 2)
Cement	barrels	[3] 7,435,875	[3] $13,460,594	[3] 8,534,089	[3] $14,967,642
Clay products			[4] 26,140,688		[4] 24,550,751
Clay, raw	short tons	5,948	[2] 31,238	7,503	[2] 47,637
Coke	do	1,600,669	[2] 11,108,944	2,219,409	[2] 12,968,066
Diatomaceous earth	do	199	12,995	114	7,528
Emery	do	1,610	11,426	769	5,907
Feldspar (crude)	long tons	13,839	108,751	10,474	70,446
Ferro-alloys	do	86,230	[2] 8,355,416	115,764	[2] 12,811,534
Garnet, abrasive	short tons	7,428	623,472	7,614	669,545
Graphite, artificial	pounds	10,986,192	(1 2)	12,135,655	(1 2)
Gypsum	short tons	1,474,491	14,329,246	1,730,254	16,219,906
Iron ore:					
Sold to furnaces	long tons	303,386	1,448,616	413,517	1,988,735
Sold for paint	do	12,966	63,955	15,731	85,691
Iron, pig	do	1,914,545	[2] 38,150,486	2,151,036	[2] 40,435,443
Lime	short tons	98,592	991,799	104,829	1,030,960
Magnesium	pounds	(1 2)	(1 2)	(1 2)	(1 2)
Marl, calcareous	short tons	(1)	(1)		
Millstones			18,215		14,063
Mineral waters	gallons sold	(5)	(5)	(5)	(5)
Natural gas	M cubic feet	6,196,000	3,632,000	6,210,000	3,778,000
Natural-gas gasoline	gallons	477,000	50,000	414,000	46,000
Peat	short tons	508	7,438	767	7,797
Petroleum	barrels	1,440,000	5,245,000	1,695,000	6,270,000
Pyrites	long tons	7,593	16,705	6,168	13,878
Salt	short tons	1,972,808	6,739,597	2,053,970	7,133,244
Sand and gravel	do	13,397,540	8,583,193	14,966,616	9,750,433
Sand-lime brick	thousands	[4] 16,529	[4] 220,851	[4] 13,259	[4] 190,870
Silica (quartz)	short tons	(1)	(1)	(1)	(1)
Slate			962,276		851,715
Stone	short tons	7,557,320	10,981,814	[6] 8,869,200	[6] 12,358,238
Talc	do	78,340	1,162,488	85,109	993,913
Zinc	do	4,664	606,320	5,158	784,016
Miscellaneous [7]			25,468,760		25,900,609
Total value, eliminating duplications			95,435,299		102,035,557

[1] Value included under "Miscellaneous."
[2] Value not included in total value for State.
[3] Exclusive of natural cement, value for which is included under "Miscellaneous."
[4] Figures obtained through cooperation with Bureau of the Census
[5] No canvass.
[6] Exclusive of basalt and unclassified stone, value for which is included under "Miscellaneous."
[7] Includes minerals indicated by "[1]", "[3]", and "[6]" above.

Mineral production of North Carolina in 1924 and 1925

Product	1924		1925	
	Quantity	Value	Quantity	Value
Aluminum pounds	[1 2]	[1 2]	[1 2]	[1 2]
Barite short tons	[1]	[1]	[1]	[1]
Clay products		[3] $4,000,431		[3] $3,868,962
Clay, raw short tons	16,966	[2] 277,526	18,983	[2] 310,683
Coal do	57,094	224,000	65,153	283,000
Feldspar (crude) long tons	97,075	640,403	76,806	496,563
Gems and precious stones		[4]		[4]
Gold troy ounces	220	4,540	897	18,540
Iron ore long tons	12,525	32,512	22,011	49,511
Lime short tons	[1]	[1]	[1]	[1]
Manganese ore long tons			[1]	[1]
Marl, calcareous short tons	[1]	[1]	[1]	[1]
Mica:				
Scrap do	3,212	59,620	5,095	74,818
Sheet pounds	597,385	108,656	592,478	105,376
Millstones		1,615		[1]
Mineral waters gallons sold	[4]	[4]	[4]	[4]
Sand and gravel short tons	1,098,192	889,050	1,108,035	886,351
Sand and sandstone (finely ground) do	[1]	[1]	[1]	[1]
Silica (quartz) do	655	2,477	2,708	10,692
Silver troy ounces	31	21	103	75
Stone short tons	1,340,840	3,133,510	[5] 1,565,690	[5] 3,478,855
Talc and soapstone do	6,093	81,523	[1]	[1]
Miscellaneous [6]		7,604,509		6,060,120
Total value, eliminating duplications		9,261,467		9,504,063

[1] Value included under "Miscellaneous."
[2] Value not included in total value for State.
[3] Figures obtained through cooperation with Bureau of the Census.
[4] No canvass.
[5] Exclusive of marble, value for which is included under "Miscellaneous."
[6] Includes minerals indicated by "[1]" and "[5]" above.

Mineral production of North Dakota in 1924 and 1925

Product	1924		1925	
	Quantity	Value	Quantity	Value
Clay products		[1] $168,855		[1] $149,774
Clay, raw short tons	26	[2] 440	29	[2] 312
Coal do	1,200,527	2,473,000	1,324,620	2,445,000
Marl, calcareous do	[3]	[3]		
Mineral waters gallons sold	[4]	[4]	[4]	[4]
Natural gas M cubic feet	[3]	[3]	[3]	[3]
Sand and gravel short tons	312,966	86,366	248,084	67,155
Miscellaneous		7,256		100
Total value, eliminating duplications		2,735,477		2,662,029

[1] Figures obtained through cooperation with Bureau of the Census.
[2] Value not included in total value for State.
[3] Value included under "Miscellaneous."
[4] No canvass.

Mineral production of Ohio in 1924 and 1925

Product		1924		1925	
		Quantity	Value	Quantity	Value
Bromine	pounds	12,393	$3,491	(1)	(1)
Calcium chloride	short tons	1,470	12,731	(1)	(1)
Cement	barrels	[2] 4,298,027	[2] 7,836,325	[2] 5,426,768	[2] $9,600,084
Clay products			[3] 97,831,641		[3] 97,991,821
Clay, raw	short tons	266,342	[4] 576,903	309,109	[4] 761,488
Coal	do	30,473,007	62,011,000	28,034,112	54,057,000
Coke	do	[5] 5,723,074	[5] 31,008,209	[5] 7,105,129	[5] 34,190,691
Ferro-alloys	long tons	60,343	[4] 1,769,077	105,198	[4] 3,005,337
Grindstones and pulpstones	short tons	30,539	1,154,145	29,460	1,065,301
Gypsum	do	525,485	5,620,099	551,479	6,394,132
Iron ore	long tons	244	(1)	2,410	(1)
Iron, pig	do	7,434,487	[4] 159,701,131	8,857,615	[4] 173,418,068
Lime	short tons	934,407	9,511,270	1,089,385	10,970,605
Marl, calcareous	do			(1)	(1)
Mineral paints, zinc and lead pigments	do	([1] [4])	([1] [4])	([1] [4])	([1] [4])
Mineral waters	gallons sold	([6])	([6])	([6])	([6])
Natural gas	M cubic feet	47,396,000	24,203,000	43,235,000	22,377,000
Natural-gas gasoline	gallons	9,443,000	1,148,000	8,701,000	990,000
Petroleum	barrels	6,811,000	17,165,000	7,212,000	18,280,000
Pyrites	long tons	73	(1)	100	300
Rubbing stones, scythestones, and whetstones	short tons	174	22,727	225	35,750
Salt	do	1,102,214	3,641,585	1,173,590	4,116,625
Sand and gravel	do	10,379,361	7,441,659	11,296,160	8,353,913
Sand-lime brick	thousands	([1] [3])	([1] [3])	([1] [3])	([1] [3])
Stone	short tons	10,455,060	11,280,865	[7] 12,010,510	[7] 13,084,572
Sulphuric acid [8]	do	([1] [4])	([1] [4])	([1] [4])	([1] [4])
Miscellaneous [9]			5,357,573		4,933,529
Total value, eliminating duplications			249,049,648		247,506,588

[1] Value included under "Miscellaneous."
[2] Exclusive of natural cement, value for which is included under "Miscellaneous."
[3] Figures obtained through cooperation with Bureau of the Census.
[4] Value not included in total value for State.
[5] Exclusive of 109,625 tons of beehive coke in 1924 and 156,058 tons in 1925, value for which is included under "Miscellaneous," but not in total value for State.
[6] No canvass.
[7] Exclusive of unclassified stone, value for which is included under "Miscellaneous."
[8] From zinc smelting.
[9] Includes minerals indicated by "[1]", "[2]", "[5]", and "[7]" above.

Mineral production of Oklahoma in 1924 and 1925

Product	1924		1925	
	Quantity	Value	Quantity	Value
Asphalt (native)—short tons	17,961	$80,825	27,450	$82,830
Cement—barrels	(1)	(1)	(1)	(1)
Chats—short tons	161,000	23,900	269,000	49,900
Clay products		[2] 1,963,484		[2] 1,813,425
Coal—short tons	2,329,615	8,590,000	2,325,840	7,667,000
Gypsum—do	316,134	2,600,081	320,931	2,599,463
Lead—do	71,358	11,417,280	79,946	13,910,604
Lime—do	(1)	(1)	(1)	(1)
Mineral waters—gallons sold	(3)	(3)	(3)	(3)
Natural gas—M cubic feet	214,452,000	31,045,700	249,285,000	36,121,000
Natural-gas gasoline—gallons	301,062,000	23,338,000	390,861,000	40,973,000
Petroleum—barrels	173,538,000	272,450,000	176,768,000	348,230,000
Sand and gravel—short tons	1,846,268	894,455	1,626,758	958,657
Stone—do	[4] 1,303,030	[4] 1,499,297	1,418,960	1,613,436
Tripoli—do	(1)	(1)	(1)	(1)
Zinc—do	269,137	34,987,810	283,371	43,072,392
Miscellaneous [5]		4,139,833		4,675,411
Total value, eliminating duplications		393,030,665		501,767,118

[1] Value included under "Miscellaneous."
[2] Figures obtained through cooperation with Bureau of the Census.
[3] No canvass.
[4] Exclusive of unclassified stone, value for which is included under "Miscellaneous."
[5] Includes minerals indicated by "[1]" and "[4]" above.

Mineral production of Oregon in 1924 and 1925

Product	1924		1925	
	Quantity	Value	Quantity	Value
Briquets, fuel—short tons	([1] [2])	([1] [2])	([1] [2])	([1] [2])
Cement—barrels	(1)	(1)	(1)	(1)
Chromite—long tons	100	$200		
Clay products		[3] [4] 701,577		[3] [4] $839,286
Clay, raw—short tons	134	[2] 512	([1] [2])	([1] [2])
Coal—do	(1)	(1)	(1)	(1)
Copper—pounds	768,395	100,660	106,325	15,098
Diatomaceous earth—short tons	(1)	(1)	(1)	(1)
Gems and precious stones		(5)		(5)
Gold—troy ounces	26,695	551,842	18,983	392,409
Gypsum—short tons	(1)	(1)	(1)	(1)
Lead—do	(6)	41	3	488
Lime—do	(1)	(1)	(1)	(1)
Mercury—flasks	(1)	(1)		
Mineral waters—gallons sold	(5)	(5)	(5)	(5)
Platinum and allied metals—troy ounces	15	2,073	89	18,858
Sand and gravel—short tons	2,238,056	1,615,114	2,990,845	1,998,545
Silver—troy ounces	38,103	25,529	32,793	22,758
Stone—short tons	1,592,530	1,624,602	1,690,930	1,858,644
Miscellaneous [7]		3,392,044		3,440,958
Total value, eliminating duplications		7,364,232		7,826,711

[1] Value included under "Miscellaneous."
[2] Value not included in total value for State.
[3] Figures obtained through cooperation with Bureau of the Census.
[4] Exclusive of pottery, value for which is included under "Miscellaneous."
[5] No canvass.
[6] 513 pounds.
[7] Includes minerals indicated by "[1]" and "[4]" above.

Mineral production of Pennsylvania in 1924 and 1925

Product	1924		1925	
	Quantity	Value	Quantity	Value
Briquets, fuel short tons	93,447	[1] $543,399	115,138	[1] $730,565
Cement barrels	[2] 40,208,860	[2] 69,693,517	[2] 41,899,787	[2] 72,870,981
Clay products		[3] 52,167,366		[3] 54,369,402
Clay, raw short tons	661,918	[1] 1,942,708	759,345	[1] 2,218,658
Coal:				
Anthracite do	87,926,862	477,230,852	61,817,149	327,664,512
Bituminous do	130,633,773	295,164,000	136,928,019	287,899,000
Coke do	16,927,437	[1] 72,568,096	19,427,603	[1] 76,394,478
Copper pounds	1,114,694	146,025	1,035,824	147,087
Feldspar (crude) long tons	1,481	4,763	1,330	4,722
Ferro-alloys do	260,623	[1] 24,618,060	300,277	[1] 29,143,978
Gems and precious stones		[4]		[4]
Gold troy ounces	214	4,424	237	4,900
Iron ore:				
Sold to furnaces long tons	807,411	1,881,122	917,255	2,149,800
Sold for paint do	3,005	[5]	2,293	[5]
Iron, pig do	10,962,288	[1] 237,052,035	12,537,809	[1] 258,140,674
Lime short tons	700,380	5,634,806	794,951	6,425,675
Mineral paints, zinc and lead pigments do	[1 5]	[1 5]	[1 5]	[1 5]
Mineral waters gallons sold	[4]	[4]	[4]	[4]
Natural gas M cubic feet	105,863,000	45,546,000	101,632,000	47,098,000
Natural-gas gasoline gallons	19,254,000	2,266,000	18,850,000	2,185,000
Peat short tons	[5]	[5]	[5]	[5]
Petroleum barrels	7,486,000	27,025,000	8,097,000	29,310,000
Potash (K_2O) short tons	[5]	[5]	[5]	[5]
Sand and gravel do	11,315,209	10,927,752	12,604,065	11,438,788
Sand and sandstone (finely ground) do	[5]	[5]	[5]	[5]
Sand-lime brick thousands	[3 5]	[3 5]	[3 5]	[3 5]
Silica (quartz) short tons	[5]	[5]	[5]	[5]
Silver troy ounces	2,810	1,883	3,120	2,165
Slate		5,157,868		5,885,179
Stone short tons	[6] 14,559,490	[6] 17,966,836	[6] 16,124,590	[6] 18,870,945
Sulphuric acid (60° Baumé)[7] do	118,452	[1] 1,072,000	141,818	[1] 1,224,000
Talc do	[5]	[5]	[5]	[5]
Tripoli (rottenstone) do	[5]	[5]	[5]	[5]
Miscellaneous [8]		12,891,425		14,636,386
Total value, eliminating duplications		1,011,630,879		867,196,142

[1] Value not included in total value for State.
[2] Exclusive of natural cement, value for which is included under "Miscellaneous."
[3] Figures obtained through cooperation with Bureau of the Census.
[4] No canvass.
[5] Value included under "Miscellaneous."
[6] Exclusive of serpentine, value for which is included under "Miscellaneous."
[7] From zinc smelting.
[8] Includes minerals indicated by "[2]", "[5]", and "[6]" above.

Mineral production of Rhode Island in 1924 and 1925

Product	1924		1925	
	Quantity	Value	Quantity	Value
Clay products		[1 2]		[1 2]
Coke short tons	[1 3]	[1 3]	[1 3]	[1 3]
Graphite, amorphous do	[1]	[1]	[1]	[1]
Lime do	[1]	[1]	[1]	[1]
Mineral waters gallons sold	[4]	[4]	[4]	[4]
Sand and gravel short tons	46,378	$35,932	131,535	$45,157
Stone do	[5] 171,350	[5] 742,701	[5] 153,230	[5] 724,428
Miscellaneous [6]		1,480,623		1,803,150
Total value, eliminating duplications		1,132,641		1,151,857

[1] Value included under "Miscellaneous."
[2] Figures obtained through cooperation with Bureau of the Census.
[3] Value not included in total value for State.
[4] No canvass.
[5] Exclusive of limestone, value for which is included under "Miscellaneous."
[6] Includes minerals indicated by "[1]" and "[5]" above.

Mineral production of South Carolina in 1924 and 1925

Product		1924		1925	
		Quantity	Value	Quantity	Value
Barite	short tons	[1]	[1]	[1]	[1]
Clay products			[2] $1,511,154		[2] $1,906,241
Clay, raw	short tons	41,544	[3] 421,713	55,725	[3] 634,278
Marl, calcareous	do	[1]	[1]	[1]	[1]
Mica:					
Scrap	do	[1]	[1]	[1]	[1]
Sheet	pounds			[1]	[1]
Mineral waters	gallons sold	[4]	[4]	[4]	[4]
Phosphate rock	long tons			2,147	8,051
Sand and gravel	short tons	743,746	364,977	511,497	227,996
Stone	do	824,030	1,527,114	833,100	1,315,613
Miscellaneous [5]			41,121		49,903
Total value, eliminating duplications			3,444,366		3,507,804

[1] Value included under "Miscellaneous."
[2] Figures obtained through cooperation with Bureau of the Census.
[3] Value not included in total value for State.
[4] No canvass.
[5] Includes minerals indicated by "[1]" above.

Mineral production of South Dakota in 1924 and 1925

Product		1924		1925	
		Quantity	Value	Quantity	Value
Arsenious oxide	short tons	83	$6,659		
Cement	barrels			[1]	[1]
Clay products			[1 2]		[1 2]
Clay, raw	short tons	500	[3] 3,850	1,045	[3] $9,680
Coal	do	12,043	36,000	14,447	42,000
Columbite	pounds	1,197	598		
Feldspar (crude)	long tons	[1]	[1]	[1]	[1]
Flint lining for tube mills	short tons	[1]	[1]	2,400	30,000
Gems and precious stones			[4]		[4]
Gold	troy ounces	295,930	6,117,421	289,747	5,989,604
Gypsum	short tons	[1]	[1]	[1]	[1]
Lime	do	[1]	[1]	[1]	[1]
Lithium minerals	do	[1]	[1]	[1]	[1]
Mica:					
Scrap	do	458	9,267	996	19,220
Sheet	pounds	[1]	[1]	1,555	207
Mineral waters	gallons sold	[4]	[4]	[4]	[4]
Natural gas	M cubic feet	3,000	2,500	4,200	2,300
Pebbles for grinding	short tons	[1]	[1]		
Sand and gravel	do	323,303	113,602	1,769,922	576,248
Sand-lime brick	thousands	[1 2]	[1 2]	[1 2]	[1 2]
Silver	troy ounces	86,548	57,987	96,133	66,716
Stone	short tons	[5] 166,970	[5] 362,508	211,880	456,342
Tungsten ore (60 per cent concentrates)	do	[1]	[1]		
Miscellaneous [6]			219,134		789,013
Total value, eliminating duplications			6,925,676		7,971,650

[1] Value included under "Miscellaneous."
[2] Figures obtained through cooperation with Bureau of the Census.
[3] Value not included in total value for State.
[4] No canvass.
[5] Exclusive of unclassified stone, value for which is included under "Miscellaneous."
[6] Includes minerals indicated by "[1]" and "[5]" above.

Mineral production of Tennessee in 1924 and 1925

Product		1924		1925	
		Quantity	Value	Quantity	Value
Aluminum	pounds	[1] [2]	[1] [2]	[1] [2]	[1] [2]
Barite	short tons	39,643	$302,873	47,012	$345,038
Bauxite	long tons	[1]	[1]	[1]	[1]
Cement	barrels	[1]	[1]	[1]	[1]
Clay products			[3] 4,933,152		[3] [4] 3,941,395
Clay, raw	short tons	145,936	[2] 602,091	210,141	[2] 618,192
Coal	do	4,556,555	9,711,000	5,454,011	10,077,000
Coke	do	207,475	[3] 1,012,064	216,488	[3] 1,161,100
Copper	pounds	18,335,635	2,401,968	19,788,234	2,809,929
Ferro-alloys	long tons	16,192	[3] 1,250,902	19,122	[3] 1,324,957
Gold	troy ounces	329	6,800	359	7,421
Iron ore:					
Sold to furnaces	long tons	179,293	431,682	164,073	369,144
Sold for paint	do	560	[1]	644	[1]
Iron, pig	do	126,660	[2] 2,782,154	95,186	[2] 2,014,176
Iron sinter from copper sulphide ore	do			4,884	[1]
Lead	short tons	937	149,920	448	77,952
Lime	do	144,292	1,111,781	175,685	1,344,508
Manganese ore	long tons	455	11,611	352	8,800
Manganiferous ore	do			[1]	[1]
Mineral waters	gallons sold	[5]	[5]	[5]	[5]
Natural gas	M cubic feet	1,200	450	8,500	2,000
Petroleum	barrels	10,000	18,000	24,000	53,000
Phosphate rock	long tons	388,697	1,976,188	464,240	2,334,995
Sand and gravel	short tons	1,942,309	1,483,600	1,966,730	1,533,251
Silver	troy ounces	94,779	63,502	102,949	71,446
Slate			[1]		[1]
Stone	short tons	[6] 1,437,280	[6] 3,867,072	[6] 1,835,150	[6] 4,334,891
Sulphuric acid (60° Baumé)[7]	do	288,530	[1] [2]	379,670	[1] [2]
Tripoli	do	[1]	[1]	[1]	[1]
Zinc	do	14,376	1,868,880	16,256	2,470,912
Miscellaneous [8]			14,744,149		16,590,792
Total value, eliminating duplications			35,354,525		38,869,198

[1] Value included under "Miscellaneous."
[2] Value not included in total value for State.
[3] Figures obtained through cooperation with Bureau of the Census.
[4] Exclusive of pottery, value for which is included under "Miscellaneous."
[5] No canvass.
[6] Exclusive of sandstone, value for which is included under "Miscellaneous."
[7] From copper smelting.
[8] Includes minerals indicated by "[1]", "[4]", and "[6]" above.

Mineral production of Texas in 1924 and 1925

Product		1924		1925	
		Quantity	Value	Quantity	Value
Asphalt (native)	short tons	220,598	$779,696	204,530	$692,730
Cement	barrels	4,488,143	8,322,658	4,735,521	8,729,046
Clay products			[1] 5,469,908		[1] 6,298,045
Clay, raw	short tons	3,185	[2] 20,006	4,821	[2] 20,247
Coal	do	1,147,011	1,721,000	1,008,375	1,566,000
Fuller's earth	do	30,279	313,782	30,462	310,145
Gems and precious stones			[3]		[3]
Graphite, crystalline	pounds	1,215,600	35,042	[4]	[4]
Gypsum	short tons	402,245	2,629,110	558,132	3,721,954
Lead	do			8	1,392
Lime	do	60,565	570,334	74,638	698,138
Mercury	flasks	[4]	[4]	[4]	[4]
Mineral waters	gallons sold	[3]	[3]	[3]	[3]
Natural gas	M cubic feet	107,247,000	13,748,000	134,872,000	19,715,000
Natural-gas gasoline	gallons	186,571,000	14,460,000	214,092,000	22,606,000
Petroleum	barrels	134,522,000	203,870,000	144,648,000	262,270,000
Salt	short tons	[4]	[4]	[4]	[4]
Sand and gravel	do	5,674,651	2,850,955	6,693,476	3,478,517
Sand-lime brick	thousands	[14]	[14]	[14]	[14]
Silver	troy ounces	720,739	482,895	552,000	383,088
Stone	short tons	2,207,050	1,886,798	[5] 2,503,300	[2] 2,076,560
Sulphur	long tons	[4]	[4]	[4]	[4]
Miscellaneous [6]			15,588,845		18,665,014
Total value, eliminating duplications			272,729,023		351,211,629

[1] Figures obtained through cooperation with Bureau of the Census.
[2] Value not included in total value for State.
[3] No canvass.
[4] Value included under "Miscellaneous."
[5] Exclusive of basalt and sandstone, value for which is included under "Miscellaneous."
[6] Includes minerals indicated by "[4]" and "[5]" above.

Mineral production of Utah in 1924 and 1925

Product		1924		1925	
		Quantity	Value	Quantity	Value
Arsenious oxide	short tons	12,528	$1,002,282	6,099	$365,940
Asphalt (native)	do	36,536	664,280	39,790	786,300
Cement	barrels	(1)	(1)	(1)	(1)
Clay products			[2 3] 1,047,199		[2 3] 1,017,752
Clay, raw	short tons	10,419	[4] 33,367	15,211	[4] 66,982
Coal	do	4,488,157	12,057,000	4,690,342	11,991,000
Coke	do	257,094	[1 4]	314,159	[1 4]
Copper	pounds	242,138,165	31,720,100	236,486,540	33,581,089
Diatomaceous earth	short tons	20	300		
Fluorspar	do	184	3,292		
Gems and precious stones			[5]		[5]
Gold	troy ounces	146,487	3,028,152	177,803	3,675,516
Gypsum	short tons	90,221	335,588	(1)	(1)
Iron ore	long tons	164,154	234,348	268,529	361,251
Iron, pig	do	[1 4]	[1 4]	126,746	[1 4]
Lead	short tons	116,955	18,712,870	153,335	26,680,275
Lime	do	12,853	172,434	22,062	265,060
Manganese ore	long tons			50	(1)
Manganiferous ore	do	116	1,010	1,162	(1)
Marl, calcareous	short tons	(1)	(1)	(1)	(1)
Mineral soap	do	138	(1)	(1)	(1)
Petroleum	barrels	(1)	(1)	4,000	4,000
Platinum	troy ounces	1	118		
Pumice	short tons	(1)	(1)		
Salt	do	78,577	463,143	88,150	432,846
Sand and gravel	do	659,588	154,793	466,449	189,122
Sand and sandstone (finely ground)	do	(1)	(1)		
Silica (quartz)	do	(1)	(1)		
Silver	troy ounces	17,253,692	11,559,974	21,276,689	14,766,022
Slate	short tons				(1)
Stone	do	640,100	446,490	878,270	459,722
Sulphur	long tons			(1)	(1)
Uranium and vanadium ores	short tons	(1)	(1)	(1)	(1)
Zinc	do	9,281	1,206,541	23,306	3,998,492
Miscellaneous [6]			4,537,889		7,100,297
Total value, eliminating duplications			84,356,626		100,275,442

[1] Value included under "Miscellaneous."
[2] Figures obtained through cooperation with Bureau of the Census.
[3] Exclusive of pottery, value for which is included under "Miscellaneous."
[4] Value not included in total value for State.
[5] No canvass.
[6] Includes minerals indicated by "1" and "3" above.

Mineral production of Vermont in 1924 and 1925

Product		1924		1925	
		Quantity	Value	Quantity	Value
Clay products			[1 2]		[2] $98,564
Clay, raw	short tons	383	[3] $3,826	1,733	[3] 9,444
Lime	do	56,484	710,739	66,245	788,936
Mineral waters	gallons sold	[4]	[4]	[4]	[4]
Sand and gravel	short tons	131,453	34,795	192,227	35,608
Scythestones	do	(1)	(1)	(1)	(1)
Slate			4,010,346		3,963,025
Stone	short tons	[5] 295,880	[5] 9,066,073	[5] 283,030	[5] 8,958,846
Talc	do	61,653	573,747	54,883	533,603
Miscellaneous [6]			153,729		30,351
Total value, eliminating duplications			14,549,429		14,408,933

[1] Value included under "Miscellaneous."
[2] Figures obtained through cooperation with Bureau of the Census.
[3] Value not included in total value for State.
[4] No canvass.
[5] Exclusive of sandstone, value for which is included under "Miscellaneous."
[6] Includes minerals indicated by "1" and "5" above.

Mineral production of Virginia in 1924 and 1925

Product	1924		1925	
	Quantity	Value	Quantity	Value
Barite—short tons	[1]	[1]	[1]	[1]
Briquets, fuel—do	[1 2]	[1 2]	[1 2]	[1 2]
Cement—barrels	[1]	[1]	[1]	[1]
Clay products		[3] $4,288,640		[3 4] $3,909,634
Clay, raw—short tons	14,466	[2] 121,249	20,963	[2] 163,857
Coal—do	10,693,464	21,823,000	12,799,443	23,496,000
Coke—do	485,064	[2] 2,343,081	421,691	[2] 1,901,623
Emery—do	[1]	[1]		
Feldspar (crude)—long tons	[1]	[1]	[1]	[1]
Ferro-alloys—do	[1 2]	[1 2]	[1 2]	[1 2]
Gold—troy ounces	6	116	3	68
Gypsum—short tons	[1]	[1]	[1]	[1]
Iron ore—long tons	91,759	250,279	76,302	174,454
Iron, pig—do	94,462	[2] 2,268,022	97,884	[2] 2,237,749
Lead—short tons	1,275	204,000	2,229	387,846
Lime—do	172,776	1,409,447	192,429	1,491,568
Manganese ore—long tons	1,565	59,220	3,121	99,981
Manganiferous ore—do	204	[1]	1,800	[1]
Marl, calcareous—short tons	28,940	74,059	31,114	70,354
Mica:				
Scrap—do	[1]	[1]	[1]	[1]
Sheet—pounds	[1]	[1]	[1]	[1]
Millstones		[1]		[1]
Mineral paints, zinc and lead pigments—short tons	[1 2]	[1 2]		
Mineral waters—gallons sold	[5]	[5]	[5]	[5]
Pyrites—long tons	[1]	[1]	[1]	[1]
Salt—short tons	[1]	[1]	[1]	[1]
Sand and gravel—do	1,897,909	1,534,235	2,170,000	1,491,274
Sand and sandstone (finely ground)—do	[1]	[1]	[1]	[1]
Silver—troy ounces	3	2	5	4
Slate		[6] 336,627		[6] 377,082
Stone—short tons	2,223,620	2,566,575	[7] 2,670,660	[7] 3,224,259
Talc and soapstone—do	28,219	1,306,388	[1]	[1]
Zinc—do	2,664	346,320	2,732	415,264
Miscellaneous [8]		4,718,725		7,726,331
Total value, eliminating duplications		37,962,143		41,038,393

[1] Value included under "Miscellaneous."
[2] Value not included in total value for State.
[3] Figures obtained through cooperation with Bureau of the Census.
[4] Exclusive of pottery, value for which is included under "Miscellaneous."
[5] No canvass.
[6] Exclusive of granules, etc., value for which is included under "Miscellaneous."
[7] Exclusive of marble, value for which is included under "Miscellaneous."
[8] Includes minerals indicated by "[1]", "[4]", "[6]", and "[7]" above.

Mineral production of Washington in 1924 and 1925

Product	1924		1925	
	Quantity	Value	Quantity	Value
Briquets, fuel short tons	(1 2)	(1 2)	(1 2)	(1 2)
Cement barrels	1,793,403	$4,236,554	2,499,237	$5,523,324
Clay products		[3] 2,607,397		[3] 2,619,250
Clay, raw short tons	19,773	[3] 35,699	24,170	[3] 43,645
Coal do	2,653,667	9,689,000	2,537,890	9,176,000
Coke do	71,615	[3] 573,644	79,257	[3] 617,265
Copper pounds	928,458	121,628	1,159,057	164,586
Diatomaceous earth short tons	400	5,500	(1)	(1)
Gold troy ounces	14,978	309,617	11,138	230,253
Gypsum short tons			(1)	(1)
Iron ore long tons	1,700	(1)	830	(1)
Lead short tons	1,968	314,830	2,814	489,570
Lime do	28,188	353,450	29,636	357,297
Magnesite do	52,860	139,600	56,060	560,600
Magnesium sulphate (natural) pounds	(1)	(1)	(1)	(1)
Manganese ore long tons	5,000	100,000	8,113	(1)
Mineral waters gallons sold	(4)	(4)	(4)	(4)
Pulpstones short tons	(1)	(1)	(1)	(1)
Rubbing stones do	(1)	(1)		
Sand and gravel do	3,464,557	1,398,506	4,197,660	1,763,153
Silica (quartz) do	(1)	(1)	(1)	(1)
Silver troy ounces	213,742	143,207	166,425	115,499
Stone short tons	[5] 778,460	[5] 1,596,088	576,690	1,042,165
Zinc do	455	59,208	609	92,556
Miscellaneous [6]		778,597		1,009,414
Total value, eliminating duplications		21,159,370		22,382,132

[1] Value included under "Miscellaneous."
[2] Value not included in total value for State.
[3] Figures obtained through cooperation with Bureau of the Census.
[4] No canvass.
[5] Exclusive of marble, value for which is included under "Miscellaneous."
[6] Includes minerals indicated by "[1]" and "[5]" above.

Mineral production of West Virginia in 1924 and 1925

Product	1924		1925	
	Quantity	Value	Quantity	Value
Briquets, fuel short tons			(1 2)	(1 2)
Bromine pounds	154,658	$39,139	103,310	$34,207
Calcium chloride short tons	7,052	54,740	5,930	51,785
Cement barrels	(1)	(1)	(1)	(1)
Clay products		[3] 15,625,022		[3] 15,293,371
Clay, raw short tons	63,106	[3] 128,553	68,853	[3] 135,751
Coal do	101,662,897	185,229,000	122,380,959	209,655,000
Coke do	1,328,569	[3] 6,048,638	1,546,032	[3] 6,648,745
Ferro-alloys long tons	(1 2)	(1 2)	(1 2)	(1 2)
Grindstones and pulpstones short tons	5,351	413,120	6,850	590,796
Iron, pig long tons	453,944	[3] 9,884,019	499,047	[3] 9,416,095
Lime short tons	238,714	1,884,682	270,895	1,879,223
Marl, calcareous do	17,686	53,058	17,434	53,219
Mineral waters gallons sold	(4)	(4)	(4)	(4)
Natural gas M cubic feet	182,285,000	68,000,000	180,345,000	70,903,000
Natural-gas gasoline gallons	61,549,000	7,154,000	58,201,000	6,759,000
Petroleum barrels	5,920,000	20,840,000	5,763,000	20,055,000
Salt short tons	37,561	258,089	25,870	180,053
Sand and gravel do	2,168,045	2,888,833	2,475,689	3,083,115
Sand and sandstone (finely ground) do	(1)	(1)	(1)	(1)
Stone do	2,618,290	3,040,154	3,348,200	3,349,143
Sulphuric acid [5] do	(1 2)	(1 2)	(1 2)	(1 2)
Miscellaneous [6]		2,878,278		2,241,711
Total value, eliminating duplications		307,314,205		333,527,697

[1] Value included under "Miscellaneous."
[2] Value not included in total value for State.
[3] Figures obtained through cooperation with Bureau of the Census.
[4] No canvass.
[5] From zinc smelting.
[6] Includes minerals indicated by "[1]" above.

Mineral production of Wisconsin in 1924 and 1925

Product	1924		1925	
	Quantity	Value	Quantity	Value
Barite—short tons	(1)	(1)	(1)	(1)
Briquets, fuel—do	(1 2)	(1 2)	(1 2)	(1 2)
Cement—barrels	(1)	(1)	(1)	(1)
Clay products		3 4 $1,063,164		3 4 $1,180,496
Clay, raw—short tons	257	2 883	390	2 904
Coke—do	(1 2)	(1 2)	(1 2)	(1 2)
Iron ore:				
Sold to furnaces—long tons	786,006	2,044,762	933,214	2,260,388
Sold for paint—do	1,113	(1)	2,213	6,105
Iron, pig—do	172,435	2 3,945,369	226,712	2 4,836,952
Lead—short tons	1,254	200,640	1,877	326,598
Lime—do	235,030	2,129,701	244,903	2,204,504
Manganiferous ore—long tons	175,316	606,593	404,014	(1)
Marl, calcareous—short tons	(1)	(1)	358	2,967
Mineral paints, zinc and lead pigments—short tons	(1 2)	(1 2)	(1 2)	(1 2)
Mineral waters—gallons sold	(5)	(5)	(5)	(5)
Pyrites—long tons	121	484	40	160
Sand and gravel—short tons	5,713,956	2,703,475	6,181,822	2,603,672
Sand-lime brick—thousands	(1 3)	(1 3)	(1 3)	(1 3)
Silica (quartz)—short tons	(1)	(1)	(1)	(4)
Stone—do	6 2,221,910	6 4,087,133	6 2,541,360	6 4,208,201
Sulphuric acid 7—do	(1 2)	(1 2)	(1 2)	(1 2)
Zinc—do	14,027	1,823,510	20,230	3,074,960
Miscellaneous 8		9,484,734		13,037,665
Total value, eliminating duplications		15,796,720		19,205,380

1 Value included under "Miscellaneous."
2 Value not included in total value for State.
3 Figures obtained through cooperation with Bureau of the Census.
4 Exclusive of pottery, value for which is included under "Miscellaneous."
5 No canvass.
6 Exclusive of basalt in 1924 and of basalt and unclassified stone in 1925, value for which is included under "Miscellaneous."
7 From zinc smelting.
8 Includes minerals indicated by "1", "4", and "6" above.

Mineral production of Wyoming in 1924 and 1925

Product	1924		1925	
	Quantity	Value	Quantity	Value
Clay products		1 $126,606		1 $99,771
Clay, raw—short tons	23,716	2 41,172	2,584	2 63,657
Coal—do	6,757,468	18,327,000	6,553,232	18,275,000
Gypsum—do	32,715	190,344	(3)	(3)
Iron ore—long tons	363,096	(3)	489,622	(3)
Lime—short tons	(3)	(3)		
Mineral waters—gallons sold	(4)	(4)	(4)	(4)
Natural gas—M cubic feet	46,036,000	4,081,000	45,539,000	4,149,000
Natural-gas gasoline—gallons	29,272,000	2,979,000	32,777,000	3,227,000
Petroleum—barrels	39,498,000	48,600,000	29,173,000	51,467,000
Phosphate rock—long tons	1,250	5,600	6,697	30,000
Sand and gravel—short tons	615,163	173,886	586,450	192,137
Sodium salts (carbonate and sulphate) from natural sources—short tons	(3)	(3)	(3)	(3)
Stone—do	234,620	354,057	5 133,410	5 245,058
Miscellaneous 6		656,673		1,069,949
Total value, eliminating duplications		75,494,166		78,754,915

1 Figures obtained through cooperation with Bureau of the Census.
2 Value not included in total value for State.
3 Value included under "Miscellaneous."
4 No canvass.
5 Exclusive of sandstone, value for which is included under "Miscellaneous."
6 Includes minerals indicated by "3" and "5" above.

PREFATORY NOTE TO THE REPORTS ON GOLD, SILVER, COPPER, LEAD, AND ZINC

By Frank J. Katz
Chief Engineer, Division of Mineral Statistics

In the mining industry, gold, silver, copper, lead, and zinc are closely related in both the genesis and the geologic occurrence of their ores, as well as in mining and in metallurgical treatment. Of their ores some contain all five metals, many contain three or four, and few contain only one. Gold and silver, for instance, almost everywhere show close genetic relations, and their ores are usually mined together. Lead and zinc constitute a similar pair. Copper ores almost invariably yield some silver and gold as well as copper, and most lead ores yield notable supplies of silver. Zinc ores in the Western States contribute also to the production of silver. All five metals may occur in commercial quantity in a single mine or, more commonly, in a single mining district. For these reasons each of these metals is treated in Mineral Resources in a general report, and all five metals are grouped together in "mine reports" descriptive of individual or geographically grouped States. These reports are printed in 15 pamphlets.

To facilitate advance publication each report is published separately at the earliest date possible. The general reports give figures of the output of the metals in the first marketable form, as obtained from the smelters, refineries, and mints, together with general reviews of the respective industries for the entire country. The figures given in the general reports represent the final official statistics of production for the country and of the States. The general report on gold and silver includes the statistics of recovered precious metals as determined by the Bureau of the Mint. The "mine reports" give figures of the production (called "mine production") as obtained from the mines, so far as possible in terms of recoverable metal in ores and other material sold or treated during the year; they also supply information in detail relative to the mining industry in the respective States, counties, and mining districts.

These reports, which appear as separate chapters in this volume, are as follows:

Gold and silver (general report).
Copper (general report).
Lead (general report).
Zinc (general report).
Gold, silver, copper, lead, and zinc in the Eastern States (mine report).
Silver, copper, lead, and zinc in the Central States (mine report).
Gold, silver, copper, lead, and zinc in Arizona (mine report).
Gold, silver, copper, lead, and zinc in California and Oregon (mine report).

Gold, silver, copper, lead, and zinc in Colorado (mine report).
Gold, silver, copper, lead, and zinc in Idaho and Washington (mine report).
Gold, silver, copper, lead, and zinc in Montana (mine report).
Gold, silver, copper, lead, and zinc in Nevada (mine report).
Gold, silver, copper, lead, and zinc in New Mexico and Texas (mine report).
Gold, silver, and copper in South Dakota and Wyoming (mine report).
Gold, silver, copper, lead, and zinc in Utah (mine report).

In stating quantity of ores, concentrates, and similar material the short ton of 2,000 pounds is used throughout. The term "ore" as used here denotes any metalliferous material treated at the mine or shipped to reduction plants and paid for by those plants, whether or not it nets a profit to the miner. The ore classification is necessarily arbitrary, because of the varying factors affecting mining and treatment of ores. Dry and siliceous ores comprise gold and silver ores proper, as well as fluxing ores that carry considerable quantities of iron and manganese oxides and very small quantities of gold and silver and also gold and silver ores that carry copper, lead, or zinc in quantities too low to classify them as copper, lead, zinc, or mixed ores. The copper ores include the great disseminated copper deposits of the West, the copper ores of the Lake Superior region, and other ores in which copper is the most abundant base metal paid for. The lead and zinc ores are those in which lead or zinc is the only or chief base metal present, irrespective of their precious-metal content. The mixed ores are those whose commercial value depends on the recoverable or recovered contents of two or more base metals in addition to any precious metals they may contain. If one of the metals, though present in sufficient quantity, is not recovered, that metal is disregarded in naming the ore. An improvement in metallurgy may later serve to change the name of such ore. The classification based on methods of treatment is the only satisfactory commercial classification.

It is to be understood, of course, that market values are not received by producers for metals in ore and intermediate products nor always for metals in marketable form, that payment is made in accordance with contracts for treatment or sale, and therefore that average daily quotations do not necessarily agree with average prices received.

Prices of silver, copper, lead, and zinc, 1850–1925

Year	Silver [1]	Copper [2]	Lead [3]	Zinc [4]	Year	Silver [1]	Copper [2]	Lead [3]	Zinc [4]
	Per fine ounce	*Per pound*	*Per pound*	*Per pound*		*Per fine ounce*	*Per pound*	*Per pound*	*Per pound*
1850	$1.32	$0.22	$0.05		1888	$0.94	$0.168	$0.044	$0.049
1851	1.34	.166	.05		1889	.94	.135	.039	.05
1852	1.33	.22	.05		1890	1.05	.156	.045	.055
1853	1.35	.22	.06	$0.055	1891	.99	.128	.043	.05
1854	1.35	.22	.06		1892	.87	.116	.041	.046
1855	1.34	.27	.07		1893	.78	.108	.037	.04
1856	1.34	.27	.066		1894	.63	.095	.033	.035
1857	1.35	.25	.06		1895	.65	.107	.032	.036
1858	1.34	.23	.06		1896	.68	.108	.03	.039
1859	1.36	.22	.055		1897	.60	.12	.036	.041
1860	1.35	.23	.056		1898	.59	.124	.038	.046
1861	1.33	.22	.05		1899	.60	.171	.045	.058
1862	1.35	.22	.06		1900	.62	.166	.044	.044
1863	1.345	.34	.06		1901	.60	.167	.043	.041
1864	1.345	.47	.07	.139	1902	.53	.122	.041	.048
1865	1.337	.392	.066		1903	.54	.137	.042	.054
1866	1.339	.342	.07		1904	.58	.128	.043	.051
1867	1.33	.254	.065		1905	.61	.156	.047	.059
1868	1.326	.23	.065		1906	.68	.193	.057	.061
1869	1.325	.242	.06		1907	.66	.20	.053	.059
1870	1.328	.212	.06		1908	.53	.132	.042	.047
1871	1.325	.241	.06		1909	.52	.13	.043	.054
1872	1.322	.356	.064		1910	.54	.127	.044	.054
1873	1.297	.280	.06		1911	.53	.125	.045	.057
1874	1.278	.220	.06		1912	.615	.165	.045	.069
1875	1.24	.227	.058	.07	1913	.604	.155	.044	.056
1876	1.16	.21	.061	.072	1914	.553	.133	.039	.051
1877	1.20	.19	.055	.06	1915	.507	.175	.047	.124
1878	1.15	.166	.036	.049	1916	.658	.246	.069	.134
1879	1.12	.186	.041	.052	1917	.824	.273	.086	.102
1880	1.15	.214	.05	.055	1918	1.00	.247	.071	.091
1881	1.13	.182	.048	.052	1919	1.12	.186	.053	.073
1882	1.14	.191	.049	.053	1920	1.09	.184	.08	.081
1883	1.11	.165	.043	.045	1921	1.00	.129	.045	.05
1884	1.11	.13	.037	.044	1922	1.00	.135	.055	.057
1885	1.07	.108	.040	.043	1923	.82	.147	.07	.068
1886	.99	.111	.046	.044	1924	.67	.131	.08	.065
1887	.98	.138	.045	.046	1925	.694	.142	.087	.076

[1] Report of Director of the Mint, pp. 212–213, 1914. Equivalent value of fine ounce based on average price and average rate of exchange. For 1916, 1917, and 1919, dealers' buying price, New York. For 1918, average price as stated by the Bureau of the Mint. For 1920 to 1922, New York market price for domestic silver only. For 1923, average price under Pittman Act, from January 1 to June 2, for domestic silver; average New York price for all silver after that period. For 1924 and 1925, average New York price for bar silver.

[2] Weed, W. H., Copper Handbook, vol. 11, pp. 1339, 1343, for years 1850–1903. By computation from data for years 1850–1860, p. 1339. U. S. Geological Survey computations for electrolytic copper since 1904. For 1916 and later years, average price all marketable grades.

[3] New York price, Ingalls, W. R., Lead and zinc in the United States, p. 203, 1908. U. S. Geological Survey since 1904. For 1916, outside spot quotations, New York. For 1917 and later years, average price all grades.

[4] New York price, 1875–1904, Ingalls, W. R., Lead and zinc in the United States, p. 342, 1908. St. Louis price, U. S. Geological Survey, since 1904. For 1915 and later years, average price all grades. Oral communication from C. E. Siebenthal, of the U. S. Geological Survey, for 1853 and 1864.

GOLD, SILVER, COPPER, LEAD, AND ZINC IN THE EASTERN STATES[1]

By J. P. Dunlop

MINE PRODUCTION

The total value of the mine production of gold, silver, copper, lead, and zinc in the Eastern States in 1925 was 11 per cent more than the corresponding value in 1924. Of this total value gold represented $40,612, silver $73,722, copper $2,957,016, lead $465,798, and zinc $18,531,644. The mine production of all metals increased in quantity and value, and the larger lead, zinc, and copper mines were operated steadily to take advantage of the higher prices for those metals in 1925. The quantity of ore treated increased 16 per cent.

Mine production of gold, silver, copper, lead, and zinc in the Eastern States, 1916–1925

Year	Number of mines	Ore sold or treated	Gold	Silver	Copper	Lead	Zinc	Total value
		Short tons		*Fine ounces*	*Pounds*	*Pounds*	*Pounds*	
1916	(1)	2,241,113	$64,370	100,323	17,104,303	1,582,034	[2] 290,238,000	[2] $43,338,500
1917	(1)	2,709,201	29,227	106,450	18,061,068	6,879,053	[2] 312,960,000	[2] 37,561,200
1918	(1)	2,355,688	14,352	106,585	17,858,535	5,158,329	[2] 256,260,000	[2] 28,217,800
1919	(1)	1,930,411	7,052	104,690	16,596,182	4,378,000	[2] 241,766,000	[2] 25,995,600
1920	(1)	2,418,500	8,515	112,183	17,138,675	4,003,078	[2] 206,764,000	[2] 24,278,000
1921	27	1,502,277	9,934	98,792	15,397,596	----------	135,422,000	12,616,046
1922	29	2,274,175	12,821	80,935	15,476,497	1,472,000	188,082,000	15,881,033
1923	21	2,936,637	11,919	108,799	20,487,395	2,500,000	199,180,000	18,053,666
1924	16	2,851,932	16,535	97,628	19,450,329	4,424,000	212,148,000	19,859,465
1925	19	3,315,912	40,612	106,228	20,824,058	5,354,000	226,814,000	22,068,792

[1] Figures not available. [2] Revised figures.

GOLD AND SILVER

In the Eastern States the output of gold increased from $16,535 in 1924 to $40,612 in 1925. The number of gold mines worked was no larger, and the increased production was due largely to two lode mines, one at Villa Rica, Ga., and one at Reidsville, N. C. The lode and the placer gold mines, from which has come nearly all the gold

[1] Mineral Resources, 1908, pt. 1, pp. 645 to 681, contains references to the geology of the Eastern States and gives a list of the U. S. Geological Survey, State survey, and other publications that deal with the geology and mines of those States; and Mineral Resources, 1914, pt. 1, pp. 139 to 163, contains a historical review of the production of gold in the Southern Appalachian States and a list of U. S. Geological Survey publications on gold, silver, copper, lead, and zinc in the Eastern States.

85931°—28——1

produced in the Eastern States, supplied 70 per cent of the gold in 1925 against only 32 per cent in 1924. Placers yielded only $246, siliceous ores $28,045, and copper and magnetite ores $12,321. The output of siliceous ores, most of which came from two properties, increased considerably, and the recovery of gold from them was $22,927 larger than in 1924. Gold mining in most districts was no more active in 1925 than in 1924, and except at two or three properties little capital went into development. Mining costs are still too high to attract capital to southern gold mines. The most activity in 1925 was in Douglas and McDuffie Counties in Georgia and in Montgomery and Rowan Counties in North Carolina. None of the gold mines in Alabama or South Carolina was active. The gold obtained in refining copper bullion from Tennessee and Pennsylvania, $12,321, was slightly more than in 1924.

The value of the estimated production of gold of the Southern Appalachian States for the period 1799 to 1925 is $51,111,928.

All of the silver produced in 1925, except 159 ounces from siliceous ore, was derived from copper ore and pyritiferous magnetite ore.

Mine production of gold and silver in the Eastern States in 1925, by States

State	Gold		Silver		Increase or decrease in value as compared with 1924	
	Fine ounces	Value	Fine ounces	Value	Gold	Silver
Georgia	468.41	$9,683	46	$32	+$9,028	+$29
North Carolina	896.87	18,540	108	75	+14,000	+54
Pennsylvania	237.04	4,900	3,120	2,165	+476	+282
Tennessee	358.99	7,421	102,949	71,446	+621	+7,944
Virginia	3.29	68	5	4	−48	+2
Total, 1924	1,964.60	40,612	106,228	73,722	+24,077	+8,311
	799.88	16,535	97,628	65,411		

Mine production of gold and silver in the Eastern States in 1925, by sources, in fine ounces

State	Gold			Silver		
	Placers	Dry and siliceous ore	Copper ore	Placers	Dry and siliceous ore	Copper ore
Georgia	3.29	465.12			46	
North Carolina	8.61	888.26			108	
Pennsylvania			237.04			3,120
Tennessee			358.99			102,949
Virginia		3.29			5	
Total, 1924	11.90	1,356.67	596.03		159	106,069
	9.34	247.58	542.96	1	38	97,589

COPPER

The mine production of copper in the Eastern States in 1925 was valued at $2,957,016, an increase of $409,023 compared with 1924. All of the output was derived from copper ore from three

mines in Tennessee and from copper concentrates recovered from Pennsylvania pyritiferous magnetite ore. The quantity of ore treated to produce this copper was 1,611,509 short tons. Exclusive of the magnetite ore, which was mined for its iron content and contained little copper, the average yield from copper ore was about 1.25 per cent, or 24.9 pounds to the ton; this copper ore also yielded $0.10 in gold and silver to the ton. The copper concentrates from magnetite ore contained about 2.95 per cent copper and a small quantity of gold and silver.

Copper ore directly smelted amounted to 452,864 tons, from which about 11,425,256 pounds of copper was recovered.

Copper and magnetite ores concentrated amounted to 1,158,645 tons, which yielded 63,441 tons of concentrates containing 9,398,802 pounds of copper.

LEAD

In 1925, as in 1924, the only output of lead in the Eastern States reported to the Bureau of Mines was made by mines in Tennessee and Virginia. The quantity of lead recovered was 5,354,000 pounds, or 21 per cent more than in 1924.

ZINC

The recoverable zinc in the ore mined in the Eastern States in 1925 was valued at $18,531,644.

[N. B.—The value of the zinc in New Jersey is not that of ore mined. It is the estimated smelting value of the recoverable zinc content of the ore after freight, haulage, smelting, and manufacturing charges are added.]

Zinc ore mined in New Jersey in 1925 was 606,177 short tons, in Tennessee 914,373 tons, and in New York 47,254 tons.

All of the zinc ore from Tennessee and New York went to concentrating plants and of the zinc ore from New Jersey about 390,000 tons was concentrated. In Virginia 120,459 tons of lead-zinc ore was concentrated, yielding both lead and zinc concentrates.

The recoverable zinc in the ore mined in New York in 1925 was 10,316,000 pounds, in Tennessee 32,512,000 pounds, and in Virginia 5,464,000 pounds.

REVIEW BY STATES

Alabama.—The value of the gold produced by mines in Alabama during the period 1830 to 1925 was $766,746. None was reported in 1924 and 1925. No lode mine was worked in 1925, and practically no prospect work was done at any placer property.

Georgia.—The value of the gold produced in Georgia during the period 1830 to 1925 was $17,840,057, or more than one-third of the estimated total output of the Southern Appalachian States.

In 1925 four lode mines and one placer mine produced $9,683 in gold and 46 ounces of silver. The production of gold in 1924 amounted to only $655. Of the 1925 output only $68 was from placer mining; it was from a small property in Douglas County. None of the placer mines in Lumpkin and White Counties was worked.

The largest producing lode mine in Georgia was the Pine Mountain, at Villa Rica, Douglas County. T. H. Aldrich, jr., worked this mine by open cut; the ore was crushed and cyanided.

The Standard mine and the Turkey Hill free-gold mines in Lumpkin County recovered small quantities of gold by amalgamation. A five-stamp mill was rebuilt and a compressor was installed at the latter property.

The Eastern Mines Corporation worked the Columbia mine at Thomson, in McDuffie County, and recovered considerable bullion at the 50-ton cyanide plant. The incline shaft is 400 feet deep, and 600 feet of drifts were run in 1925.

Development work only was done at the Magruder mines of the Georgia Copper Corporation at Lincolnton, Ga. The mine has a 285-foot shaft, and crosscuts of 480 feet and of 90 feet were driven on the 200-foot level.

Maine, Maryland, New Hampshire, and Vermont.—No production of gold, silver, or copper was reported in 1925 by mines in Maine, Maryland, New Hampshire, or Vermont. The estimated total gold production of Maryland has been $71,405, virtually all of which was produced prior to 1906.

New Jersey (see also p. 3).—The production of zinc ore in New Jersey in 1925 amounted to 606,177 short tons, which contained 178,522,000 pounds of recoverable zinc. All the ore mined was treated by the producer.

New York.—The quantity of zinc ore mined in New York in 1925 was 47,254 short tons, and the concentrates shipped yielded about 10,316,000 pounds of zinc.

The Brown mine of the New York Zinc Co., near Edwards, St. Lawrence County, was worked steadily through two shafts, one 960 feet deep, the other 1,560 feet deep. Ore, in limestone, was mined at various levels, the lowest at 1,200 feet. The 1,560-foot three-compartment shaft was completed in 1925, and an aerial tramway 3,000 feet long was erected to carry concentrates from the mill to the railroad. The ore mined is concentrated, then treated on Weatherby electric separating machines. The zinc concentrates, which carry almost 45 per cent zinc, are shipped to smelters, and the pyrite recovered is mainly sold to pulp mills. Description of the mines and mill is given in earlier volumes of Mineral Resources.

North Carolina.—The value of the gold produced in North Carolina during the period 1799 to 1925 was $23,658,441. The yield of gold increased from $4,540 in 1924 to $18,540 in 1925, although very few mines were active, and the increase was due entirely to work at the Rich Cog mine at Reidsville, in Montgomery County. This mine is opened by an inclined shaft 550 feet long. The 50-stamp mill is equipped with seven Wilfley tables and the ore is treated by amalgamation. The concentrates have been saved for treatment by cyanidation, but no gold was recovered from them in 1924 or 1925.

The Gold Hill mine at Gold Hill, in Brown County, was operated by the South Gold Hill Mines Co. Four test runs at the 10-stamp mill yielded some gold, by amalgamation, for shipment. A large amount of drifting was done on four gold-bearing veins in 1925.

The small output of placer gold, $178, was from McDowell and Rowan Counties; the placer mines in Burke and Rutherford Counties did not report any output.

None of the lode gold mines in Cabarrus, Moore, Davidson, or Guilford Counties was worked in 1925.

Pennsylvania.—None of the lead prospects in Bucks County produced any lead. The Cornwall iron mines in Lebanon County continued to be worked as open pits by the Bethlehem Steel Co., and yielded about 17,500 tons of low-grade copper concentrates from pyritiferous magnetite. These concentrates were recovered on Wilfley tables and were shipped to smelters; they contained about 32 per cent of sulphur, 2.95 per cent of copper, and a very little gold and silver.

South Carolina.—Mines in South Carolina yielded $5,182,305 in gold during the period 1829 to 1925. No production of gold or silver was reported from placers or lode mines in Lancaster, Spartanburg, or York Counties in 1924 or 1925, and no development work was done in 1925.

Tennessee.—The gold produced in Tennessee during the period 1831 to 1925 amounted to $294,758. Most of the output prior to 1879 was derived from placer mines in Monroe County, but the production since 1906 has come entirely from copper ores mined in Polk County. The total value of the mine production of metals in Tennessee increased in 1925; the only decrease was in lead, but the increase in gold was very small. The large increases were in quantity and value of copper and zinc.

Mine production of gold, silver, copper, lead, and zinc in Tennessee, 1905–1925

Year	Ore sold or treated	Gold	Silver	Copper	Lead	Zinc	Total value
	Short tons		*Fine ounces*	*Pounds*	*Pounds*	*Pounds*	
1905–1914	6,401,574	$57,630	808,443	182,379,746		42,662,808	$30,483,771
1915	1,149,364	6,862	100,543	18,046,010	1,660	32,922,902	7,298,406
1916	1,184,821	5,739	94,701	14,679,794	32,960	52,855,480	10,764,189
1917	1,533,983	5,326	99,053	16,033,749	5,061,937	56,995,107	10,712,985
1918	1,159,971	4,866	93,620	14,799,680	3,410,400	42,141,311	7,831,005
1919	1,227,534	5,662	98,288	15,623,589	4,376,000	46,494,000	6,647,723
1920	1,120,995	5,830	110,719	16,727,803	3,957,000	38,434,000	6,634,144
1921	889,122	4,920	98,762	15,084,294		19,384,000	3,018,756
1922	983,844	4,320	78,341	14,240,571	1,464,000	31,136,000	3,860,410
1923	1,355,547	6,615	105,712	18,721,932	2,500,000	31,800,000	5,182,823
1924	1,443,159	6,800	94,779	18,335,635	1,874,000	28,752,000	4,491,070
1925	1,711,298	7,421	102,949	19,788,234	896,000	32,512,000	5,437,660
	20,161,212	121,991	1,885,910	364,461,037	23,573,957	456,089,608	102,362,942

The entire output of copper, gold, and silver in Tennessee in 1925 came from three copper mines in the Ducktown district, and the output of ore and the metal content were larger than in 1924.

The Tennessee Copper Co. ran its 600-ton flotation plant, 1,500-ton blast furnace, Pierce Smith converter, sulphuric acid plant, and copper sulphate plant on sulphide ore from the Burra Burra, London, and Eureka mines. The pig copper was shipped to the Nichols Copper Co. for refining.

The Ducktown Chemical & Iron Co. took over the property of the Ducktown Sulphur, Copper & Iron Co. in November, 1925. These

companies operated one 600-ton blast furnace and one converter on self-fluxing sulphide ore and concentrates from the Mary mine. The larger part of the crude ore was concentrated at the 500-ton flotation plant. The Mary mine is opened by a 1,200-foot vertical shaft.

The Ocoee Copper Co. operated its mine and concentrating plant for the first time in 1925. The concentrate produced in 1925 was shipped to the Tennessee Copper Co. and to the Norfolk Smelting Co.

The Annette Mines Co. did some development work on the old Coker Creek placers, near Tellico Plains, in Monroe County. It is probable that dredges will be used to recover the gold. No output was reported in 1925.

Most of the zinc produced was obtained from the Embree mine in Washington County and the Mascot mine in Jefferson County. The only exploration or development done in 1925 was at the Grasselli property, near New Market, in Jefferson County, and at the Union mine in Union County.

The Embree mine produced its normal output of zinc carbonate and lead carbonate ores. Some of the carbonate was shipped crude, but most of it was concentrated. The zinc carbonate concentrates averaged 42.5 per cent zinc content and the lead carbonate ore and concentrates 61.9 per cent lead.

Operations at the Mascot mine and mill of the American Zinc Co. of Tennessee continued steady. The zinc ore, in dolomitic limestone, was hoisted through two 700-foot shafts and concentrated at a 125-ton per hour plant equipped with oil flotation, Cooley jigs, tables, Oliver filter, and Lowden dryer. The crushed tailings are sold for agricultural and other uses.

Virginia.—The value of the gold produced from mines in Virginia during the period 1828 to 1925 was $3,298,216, of which only about $9,000 was produced during the last 15 years. The lode and the placer gold mines in Albemarle, Floyd, Fauquier, Goochland, and Fluvanna Counties yielded about half of the total gold; the remainder was derived from cinders of pyritic ores or copper ore shipped to smelters.

Mines in Virginia in 1925 produced 3.29 ounces of gold, 5 ounces of silver, 4,458,000 pounds of lead, and 5,464,000 pounds of zinc, having a total value of $803,182. The gold and silver came from a small mine near Mineral, in Louisa County.

ANTIMONY

By J. W. Furness [1]

INTRODUCTION

If price is considered as the governing factor in the production of antimony, the dependence of the United States upon foreign sources during 1925 becomes evident.

Monthly prices of ordinary brands of antimony at New York in 1925, in cents per pound [1]

Month	Maximum	Minimum	Average	Month	Maximum	Minimum	Average
January	18.25	16.75	17.33	August	18.25	17.00	17.631
February	22.00	18.00	19.87	September	17.25	16.75	17.056
March	17.75	14.00	15.49	October	19.75	17.25	17.976
April	14.00	11.00	12.49	November	20.00	19.50	19.829
May	17.50	12.25	16.37	December	24.50	20.00	21.67
June	17.00	16.00	16.61				
July	19.50	16.50	17.714	The year			17.50

[1] American Metal Market.

In 1925 domestic mines produced 123 short tons of crude ore containing 33 tons of metallic antimony.

Some shipments were also made from accumulated stocks of ore mined in Nevada in 1917 and 1918.

One smelter in the United States reported a small production of metallic antimony from foreign ore.

The general imports of metal or regulus were 10,659 short tons. The reexports of matte, regulus, or metal were 94 tons. Stocks of metallic antimony in bonded warehouse on January 1, 1926, were 241 tons. The production of antimonial lead from domestic ore in 1925 was 14,472 tons, which contained 1,972 tons of metallic antimony. In addition to the imports of metallic antimony already mentioned, 3,005 tons of type metal and antimonial lead, containing 850 tons of metallic antimony, were imported.

[1] Figures on domestic production compiled by A. Stoll, those on imports and exports by J. A. Dorsey, from records of the Bureau of Foreign and Domestic Commerce, and those on world's production by L. M. Jones, all of the Bureau of Mines.

DOMESTIC PRODUCTION

Mine production of antimony ores in the United States, 1915–1925, in short tons [1]

Year	Total	Antimony content	Year	Total	Antimony content
1915	5,000	2,100	1922	20	4
1916	4,500	1,770	1923	40	10
1917	1,060	390	1924	113	33
1918	190	50	1925	123	33

[1] Mine production negligible prior to 1915, and no production from 1919 to 1921.

SMELTER PRODUCTION OF ANTIMONIAL LEAD

By-product antimonial lead produced in the United States from both foreign and domestic ores, 1919–1925

Year	Short tons	Antimony content	
		Short tons	Value [1]
1919	13,874	1,943	$319,000
1920	12,535	2,033	345,000
1921	10,064	1,589	158,000
1922	8,075	1,441	156,000
1923	14,190	2,170	338,500
1924	20,787	2,763	596,800
1925	19,667	2,624	918,400

[1] Calculated at average yearly price for ordinary brands of antimony as given by American Metal Market.

The value of antimonial lead is approximately $5 less per short ton than the value of the lead content plus the value of the antimony content.

RECOVERY OF SECONDARY ANTIMONY

During 1925 (according to J. P. Dunlop) 10,840 short tons of antimony, valued at $3,794,000, were recovered from old alloys, scrap, and dross. All but 1 ton of it was recovered in the form of alloys; 1,328 tons were recovered from antimonial lead scrap treated at regular smelters and 9,512 tons were recovered as metal and in alloys reported by secondary smelters.

Secondary antimony and antimony content of secondary alloys recovered from old alloys, scrap, and dross in the United States, 1919–1925

Year	Short tons	Value [1]	Year	Short tons	Value [1]
1919	4,399	$717,900	1923	8,021	$1,252,800
1920	5,600	938,560	1924	9,404	2,025,600
1921	4,720	464,400	1925	10,840	3,794,000
1922	7,090	765,700			

[1] Calculated at average yearly price for ordinary brands of antimony as given by American Metal Market.

IMPORTS AND EXPORTS

Antimony imported for consumption in the United States, 1919–1925

Year	Antimony ore [1]			Liquated antimony sulphide [2]		Metallic antimony [3]		Antimony oxides and other compounds [4]	
	Short tons	Antimony content		Short tons	Value	Short tons	Value	Short tons	Value
		Short tons	Value						
1919	993	409	$54,477	278	$19,202	7,159	$1,021,587	126	$9,501
1920	1,709	682	70,285	1,375	123,902	9,817	1,216,376	298	25,260
1921	213	98	11,682	353	17,577	10,130	784,146	154	15,558
1922				689	40,108	9,344	659,242	379	65,538
1923	(5)	1,047	44,721	835	64,493	6,763	641,804	2,277	288,206
1924	(5)	899	62,999	558	52,393	6,778	840,434	1,207	190,252
1925	1,359	773	47,084	760	115,990	9,857	2,362,915	1,792	349,990

[1] Classified in tariff classification as "Antimony ore and stibnite containing antimony."
[2] Classified in tariff classification as "Antimony matte, containing not more than 10 per cent of lead"; also as "needle or liquated antimony."
[3] Classified in tariff classification as "Antimony regulus or metal."
[4] Classified in tariff classification as "Antimony, oxide, salts, and compounds of."
[5] Figures not available.

Antimony imported into the United States, 1924–25 [1]

[General imports]

Country	Antimony content of ore		Antimony metal [2]	
	Short tons	Value	Short tons	Value
1924				
Africa (Portuguese) [3]	1	$150		
Argentina	48	1,424		
Australia	109	9,171	45	$6,637
Belgium			61	8,142
Canada			5	1,252
Chile [4]	547	46,162		
China [5]			5,831	667,655
England (United Kingdom)			548	100,838
France	1	125	114	16,599
Germany			272	46,736
Hongkong [5]			(6)	12
Italy			107	13,886
Japan [5]			73	9,405
Mexico	167	4,373	220	29,756
Peru	26	1,594		
	899	62,999	7,276	900,918
1925				
Africa (British South)	3	214		
Belgium			87	16,972
Bolivia [4]	240	20,369		
Canada	6	250	4	960
Chile [4]	108	7,912		
China [5]			7,428	1,656,788
France			201	54,377
Germany			1,178	333,779
Hongkong [5]			583	121,733
Italy			57	13,769
Japan [5]			28	5,963
Mexico	416	18,339	99	13,271
Straits Settlement			28	6,994
United Kingdom			966	288,814
	773	47,084	10,659	2,513,420

[1] Includes large quantities of antimony metal that went into bonded warehouse and that are not included in the table of imports for consumption.
[2] Includes small quantities of liquated antimony sulphide, known in the trade as "crude antimony," "antimony matte," or "needle antimony."
[3] Angola and other Portuguese possessions on the West Coast of Africa.
[4] Imports credited to Chile originated mainly in Bolivia.
[5] Nearly all the imports of antimony ore and metal from Hongkong and Japan are of Chinese origin. Some of the material credited to other countries is possibly also of Chinese origin, having been transshipped in a foreign port.
[6] 224 pounds.

Type metal [1] imported for consumption in the United States, 1920–1925

Year	Type metal		Assumed antimony content		Year	Type metal		Assumed antimony content	
	Short tons	Value	Short tons	Percentage		Short tons	Value	Short tons	Percentage
1920	14,944	$1,349,495	2,063	13.8	1923	[2] 3,677	[2] $431,610	[3]	[3]
1921	19,485	1,191,553	4,132	21.2	1924	[2] 644	[2] 100,367	[3]	[3]
1922	22,448	1,120,814	5,476	24.4	1925 [1]	3,005	463,134	850	28.3

[1] Classification for 1925 is "Type metal and antimonial lead"; separate figures not recorded.
[2] Lead content only. Figures for gross weight for 1923 and 1924 not available.
[3] Data not available.

Foreign antimony (matte, regulus, or metal) exported from the United States, 1920–1925 [1]

Year	Short tons	Value	Year	Short tons	Value
1920	448	$51,607	1923	8	$1,047
1921	150	15,741	1924	140	14,441
1922	19	1,548	1925	94	17,376

[1] During 1922 there was also exported, mainly to Canada, 112 tons of regulus or metal of domestic manufacture, valued at $13,961. This is the first export of domestic antimony of which there is any record. However, antimony manufactured in the United States from foreign ores and exported would also be classed as domestic exports. Similar exports for 1923–1925 are not shown.

USES

About 50 per cent of the world's production of antimony finds its way into the United States, and in times of peace 75 per cent of the imports are utilized in the manufacture of type metal, antifriction bearings for machinery, britannia metal, and hard metal (antimonial lead). Of the 30 odd uses to which antimony is put, virtually all can be taken care of satisfactorily by substitutes, many of which are on a stronger industrial footing than antimony and its alloys; as an example, in the hardening of lead either calcium, barium, strontium, magnesium, or copper may be used. Alloys of barium and calcium successfully compete with antimonial alloys as bearing metals. Antimony is used as a pigment and as a mordant, but many metals can be used satisfactorily in its place. Antimony does not seem to possess any characteristics that make it irreplaceable. Broadly speaking, it is a cheap metal which can be used as a substitute for more expensive metals, and in many uses it replaces them and is not as a rule replaced by them. The uses of antimony have been covered in earlier chapters on antimony in Mineral Resources of the United States; in Imperial Institute Monograph, Antimony Ores, by Edward Halse, 1920; and Political and Commercial Geology and the World's Mineral Resources, by J. E. Spurr, 1920.

WORLD SOURCES

World's production of antimony, 1917–1925, in metric tons

[Approximate recoverable metal content of ore produced, exclusive of antimonial lead ores]

Country	1917	1918	1919	1920	1921	1922	1923	1924	1925
North America:									
Canada	87	[1] 7	[1] 14						
Mexico	2,647	3,279	471	623	45	464	490	775	1,399
United States	310	45				4	8	24	24
South America:									
Argentina	[2] 650	[2] 360	[2] 27	[2] 50	(3)	[1] 1	[1] 5		[1] 10
Bolivia [1]	10,288	3,010	105	484	282	185	312	621	1,384
Peru [1]	433	155	30	7	7			(3)	(3)
Europe:									
Austria	38		1			139	62	1	(3)
Czechoslovakia	(4)	(3)	153	330	384	100	453	1,066	(3)
France	2,354	1,329	998	1,130	1,276	834	691	674	648
Greece			55	46					(3)
Hungary	406	(3)	66	93			(3)	(3)	(3)
Italy	689	404	10	187	76	146	271	372	354
Portugal							8	14	(3)
Spain	148	22					25		(3)
Yugoslavia	725	(3)	(3)	(3)	(3)	(3)	131	414	(4)
Asia:									
China [1]	28,450	15,597	7,721	13,001	14,658	13,858	14,256	12,059	18,928
India, British	61		2		1				(3)
Indo-China	[1] 800	(3)	(3)	(3)	(3)	(3)	(3)		(3)
Japan	1,606	95	1						(3)
Turkey (Asia Minor) [5]	400	400	400	400	400	400	400	400	400
Africa:									
Algeria [1]	4,550	2,218	723	1,000	103	579	500	905	1,461
Nigeria [1]			(5)	(5)	(5)	(5)	(5)	(3)	(3)
Rhodesia, Southern	3	3		2					(3)
Union of South Africa	232	38	10						(3)
Oceania:									
Australia—									
New South Wales	150	143	70	81	50				(3)
Victoria	1,045	509	491	406	141	605	421	130	(3)

[1] Exports.
[2] Railway shipments. A large part of the shipments reported are probably of Bolivian origin and therefore may duplicate in part the quantities shown for Bolivia.
[3] Data not available.
[4] Included under Austria and Hungary.
[5] Estimated.
[6] Less than 1 ton. The estimated recoverable metal content of ores exported was as follows: 1919, 169 kilograms; 1920, 178 kilograms; 1921, 74 kilograms; 1922, 190 kilograms; 1923, figures not given.

UNITED STATES

Occurrences of antimony in the United States are many, but there are few localities from which an important tonnage could be produced at any prices heretofore reached. The States that have produced antimony are Alaska, Arizona, Arkansas, California, Idaho, Nevada, Oregon, Utah, and Washington.

In the past, almost invariably when the price has exceeded 20 cents a pound sporadic production has appeared but has never furnished more than a few per cent of the domestic consumption.[2] This country is dependent upon foreign sources for its supply.

The United States, France, Germany, and Great Britain normally consume 85 per cent of the world's output. Of these countries, France is the most nearly independent of foreign sources. China furnishes nearly 90 per cent of the world's production but consumes domestically only a small percentage of what she produces. The major sources of the world's supply are China, France, Bolivia, Mexico, Australia, Czechoslovakia, and Indo-China. The minor sources are Canada, Peru, Spain, Portugal, Siberia, Algeria, British South Africa, Japan, India, and Borneo.

[2] International Control of Minerals, Report of Sub-Committee on Antimony, Am. Inst. Min. and Met. Eng., 1925, p. 22.

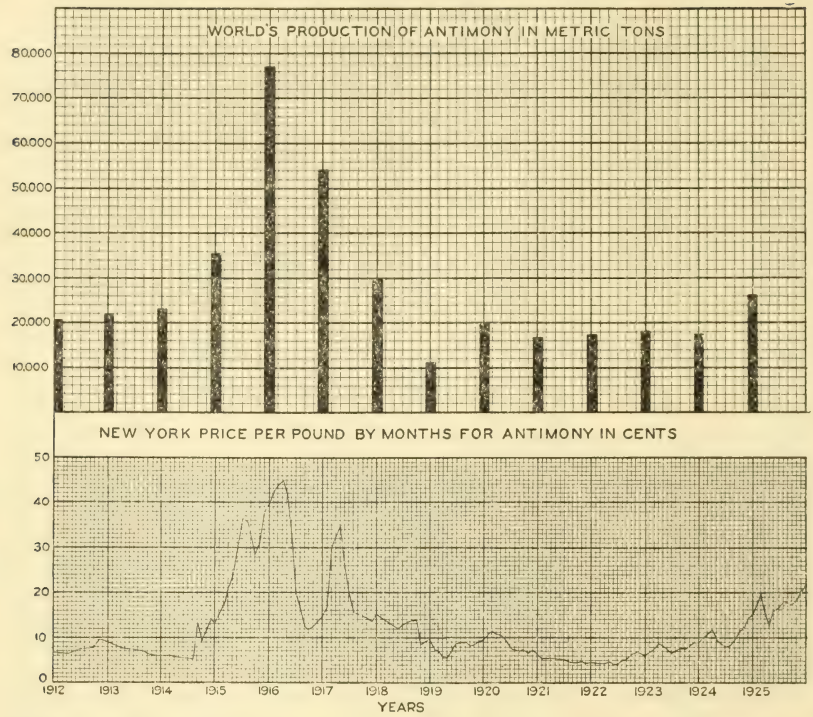

FIGURE 1.—World's production of antimony, by years, in metric tons, and New York prices of antimony, by months, in cents per pound, 1912-1825

CHINA

General statement.—China's production of antimony is not accurately known and the statistical information available is based on the exports. During the period 1908 to 1916 slightly more than 50 per cent of the world's production was furnished by China; from 1917 to 1920, 60 per cent; from 1921 to 1923, 80 per cent; and during the last two years, 90 per cent. The price at which Chinese antimony is sold is partly related to the rate of exchange and therefore fluctuates with the value of silver.

Antimony exported from China and quotations on Chinese antimony at New York, 1912–1925

Year	Exchange rate, Hongkong (taels)	Exports (metric tons)[1]	Quotation c. i. f. New York, in cents per pound		
			High	Low	Average
1912	0.74	13,531	9.30	6.83	7.76
1913	.73	13,032	8.77	6.05	7.42
1914	.67	19,645	14.14	6.03	8.53
1915	.62	23,357	39.36	15.24	29.52
1916	.79	42,800	43.87	11.57	25.33
1917	1.03	28,450	34.66	13.90	20.73
1918	1.26	15,597	14.23	8.19	12.55
1919	1.39	7,721	9.56	6.83	8.16
1920	1.24	13,001	11.55	5.00	8.38
1921	.76	14,658	5.25	4.51	4.92
1922	.83	13,858	6.81	4.13	5.42
1923	.7975	14,256	9.18	7.20	7.81
1924	.89	12,059	14.98	8.39	10.77
1925	.7577	18,928	[2]24.50	[2]11.00	[2]17.50

[1] Maritime Customs, Foreign Trade of China.

[2] American Metal Market.

During late years brokers and speculators have taken advantage of the political unrest in China and a popular belief has grown up that the unrest is the major factor regulating the world's price. This belief is probably not true. The price of antimony, like that of every other metal, is controlled by supply and demand. During 1925, when political unrest in China was markedly evident, the production was abnormally large; but there was also almost complete exhaustion of stocks in the hands of both producers and consumers. Therefore a high price was maintained during the year. On January 1, 1925, the New York price of antimony was 17½ cents. In the latter part of April antimony sold for 11⅛ cents. From this low figure the price advanced steadily and closed the year at 24½ cents.[3]

Reserves.—Antimony is found in many of the southeastern and adjoining central Provinces of China, but the major source is the Province of Hunan.[4] Of the seven or more productive fields of Hunan, the most important is Kai-kong-shan. Tegengren estimates the total reserves of the northern part of the field to be in round numbers 1,400,000 tons of metallic antimony.[5] The reserves mentioned constitute but a part of the total reserves of China. No figures are available on which to base an accurate estimate.

Variations in production in China are reflected almost immediately by fluctuations in price. Mining methods are very primitive. No investment is necessary excepting the cost of hand tools. Owing to the density of the population, labor is employed and discharged without notice and without consequences. In 1920, during the world depression, China continued to produce antimony when the world's price was 4½ cents a pound. With each additional cent or fraction thereof, production is augmented. There seems little question that if the price of antimony in China were held at 15 to 18 cents a pound, she could at least supply more than 85 per cent of the world's consumption. When the price level is above 20 cents, Bolivian and Mexican antimony comes on the market with the inevitable result of overproduction. In the past as at present, for the antimony miner it has been either a feast or a famine. The main reason for this is the fact that the antimony resources of the world have never been taxed to their capacity. Even during the war, when the production of China rose from 13,000 metric tons of metallic antimony in 1913 to 42,800 tons in 1916, the mines of that country met the increase with ease, and could have produced more.

Under normal conditions there seems no possibility that China for many years will lose its control or its position as the major antimony producer of the world.

Tariffs or enactments by other countries to foster a domestic antimony industry would have to be so abnormally high in order to offset the favorable conditions in China that they would probably bring about the use of substitutes instead of fostering domestic mining.

During the past few years there have been no discoveries of large antimony deposits, possibly because the known resources of the

[3] Prices quoted are from the Engineering and Mining Journal-Press and include the United States duty of 2 cents per pound.

[4] Hubbard, George D., "The antimony mines of Shiu Chow, China"; Am. Jour. of Sci., vol. 4, December, 1922.

[5] Tegengren, F. R., The Hsi-K'wang-shan Antimony Mining Fields, Hsin-Hua District: Hunan: The China Geological Survey Bull. 3-4, pp. 1-21.

world are sufficient for present needs. The sources which have been mentioned have been fully described in the earlier chapters on antimony in Mineral Resources of the United States. A résumé of these sources may be found in the subcommittee report on antimony,[6] already cited.

TARIFF HISTORY

The tariff history of antimony in the United States as given in Tariff Information Series, No. 21, United States Tariff Commission, 1920, pages 39 and 40, is as follows:

Antimony ores have been imported free of duty in the United States since 1870, except under the act of 1909, when the antimony content was dutiable at 1 cent a pound. Antimony regulus or metal paid an import duty of 10 per cent ad valorem for 26 years beginning in 1864. The act of 1890 changed the ad valorem rate to a specific duty of ¾ cent per pound—a reduction. In the act of 1894 antimony was on the free list, but the act of 1897 restored the former duty of ¾ cent per pound. In the act of 1909 the duty was doubled. After 23 years, under specific rates (except the three years on the free list), antimony metal was again made dutiable on an ad valorem basis in 1913, being returned to the early rate of 10 per cent. Except during 1916, when the average price was 25.1 cents per pound, this 10 per cent rate operated as a reduction in the duty as compared with the 1½-cent specific rate of the 1909 act. The tariff act of 1922 says under paragraph 8: "Antimony: Oxide, 2 cents per pound; tartar emetic or potassium-antimony tartrate, 6 cents per pound; sulphides and other antimony salts and compounds, not specially provided for, 1 cent per pound and 25 per centum ad valorem." Under paragraph 376 the act provides: "Antimony, as regulus or metal, 2 cents per pound; needle or liquated antimony, one-fourth of 1 cent per pound." Antimony ore—free of duty.

BENEFICIATION OF LOW-GRADE ORES

Tests made in 1922 by the mining branch of the Canadian Department of Mines show that stibnite may be concentrated successfully by froth flotation. From an 11 per cent ore a 58 per cent concentrate has been made with a recovery of 95 per cent. The reagents used for flotation were a mixture of 20 to 80 per cent coal-tar creosote and enough steam-distilled pine oil to maintain a good froth; 5 pounds of sulphuric acid per ton of ore were added to the feed just before it entered the cell.

METALLURGY

The smelting of antimony has been covered by Chung Yu Wang in Antimony, its History, Chemistry, Mineralogy, Geology, Metallurgy, Uses, Preparations, Analysis, Production, and Valuation; with complete Bibliographies, 1909. Since the publication of this book, no new method is known to have been adapted to the smelting of antimony. During the past few years the Selby, Calif., plant of

[6] International Control of Minerals, Report of Sub-Committee on Antimony, Am. Inst. Min. and Met. Eng., 1925, pp. 11–12.

the American Smelting & Refining Co., has been investigating the elimination of the losses that invariably have accompanied the reduction of this metal.

SUMMARY OF WORLD SITUATION

Antimony is found in many localities throughout the world. Little is known as to the actual world resources as heretofore the supply has met the demand with ease and resources have never been taxed to their maximum capacity. For many years France was the only country requiring any considerable quantity of antimony that obtained it from her domestic deposits; but with the economic exhaustion of La Lucette mine, in the Province of Mayenne, production in France has virtually ceased. Some of the needs of France are now supplied by Algeria (French owned). From what is now known of the resources of the British Empire, Burma is the only country that may supply a material portion of Great Britain's consumption at a price greater than has heretofore been reached. The inaccessibility of the Burma deposits makes them noncommercial at present.

Among the countries that utilize a large share of the world's output, the United States,[7] Germany, Japan, Spain, and Italy do not contain deposits of antimony of such size as to be of commercial importance. Of the deposits now developed those of China, Bolivia, and Mexico are large enough to guarantee the world's present annual consumption for many years. Of these countries China occupies the strategic position through ability to control, within limits, the world's output as well as the price. This statement does not mean that China can exercise what to the balance of the world would be an onerous control of prices, but that her costs of production are such as to enable her to eliminate production from other countries. The very nature of the uses of antimony renders the maintaining of a high price for the metal extremely difficult, if not impossible. High prices mean substitution and curtailment of consumption; also when the price of antimony is in excess of 15 to 17 cents per pound (New York quotation) Bolivia and Mexico begin to produce the metal and thus create a surplus that inevitably results in lower prices.

From the standpoint of the consumer of antimony in the United States, it would seem that for many years domestic needs will be supplied from China at a price range which heretofore has resulted in a domestic consumption of about 6,500 tons of metallic antimony per annum. Should prices rise higher, it is to be expected, from present knowledge of the world's reserves, that history will repeat itself; overproduction will result and prices will revert to the range at which the world's demand has heretofore been supplied.

[7] Production during war period, 1917–18. International Control of Minerals. Mining and Metallurgical Society and American Institute Mining and Metallurgical Engineers, 1925, p. 23.

BAUXITE AND ALUMINUM

By James M. Hill[1]

BAUXITE

DOMESTIC PRODUCTION—IMPORTS AND EXPORTS

Less bauxite was produced in the United States in 1925 than in 1924, owing to larger imports which reached all consuming industries. The domestic production decreased 9 per cent, virtually all of which was in the Arkansas field. There was a slight increase in production from the eastern field. Imports of bauxite increased 75 per cent.

Bauxite produced in the United States, 1921–1925

Year	Georgia, Alabama,[1] and Tennessee		Arkansas		Total	
	Long tons	Value[2]	Long tons	Value[2]	Long tons	Value[2]
1921	14,700	$134,400	124,850	$755,400	139,550	$889,800
1922	42,810	329,440	266,790	1,682,890	309,600	2,012,330
1923	28,810	176,030	493,880	2,980,580	522,690	3,156,610
1924	19,940	156,990	327,630	1,981,000	347,570	2,137,990
1925	20,220	109,800	296,320	1,878,450	316,540	1,988,250

[1] No production from Alabama in 1924 and 1925.
[2] Value f. o. b. mines.

Bauxite imported into and bauxite and bauxite concentrates exported from the United States, 1921–1925

Year	Imports for consumption		Exports (including bauxite concentrates)	
	Long tons	Value	Long tons	Value
1921	27,587	$164,589	5,942	$488,785
1922	23,656	93,805	19,617	961,203
1923	119,020	593,882	78,560	3,580,186
1924	201,974	909,493	77,065	3,979,832
1925	353,696	1,549,120	78,633	4,134,455

Bauxite was imported from British and Dutch Guiana during 1925 at the rate of 21,500 tons a month, almost double the rate in 1924. Most of it was entered at Gulf ports and used in the aluminum industry. A few cargoes of South American bauxite were shipped to

[1] The figures for imports and exports in this report have been compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

north Atlantic ports and consumed by the chemical industries. Owing to the large size, high quality, and ease of exploitation of the deposits in these countries their bauxite has replaced the domestic bauxite except that from deposits where the conditions for exploitation are exceptionally favorable.

Somewhat over 1,400 tons of alumina obtained as a by-product in the treatment of alunite for its potash content at Marysvale, Utah, was used for refractories.

Domestic bauxite was reported as sold to four consuming industries in 1925, as shown in the following table. The sales to the aluminum industry decreased 23 per cent, whereas those to the artificial abrasive industry increased 11 per cent and those to the manufacturers of aluminum salts 23 per cent.

Domestic bauxite sold by producers to industries in the United States, 1921–1925, in long tons

Industry	1921	1922	1923	1924	1925
Aluminum	91,700	211,560	380,520	225,780	173,040
Chemical	41,000	78,340	68,870	54,870	67,420
Abrasive [1]	6,850	19,270	72,830	66,400	73,720
Refractory		230	470	440	260
Alumina cement				80	

[1] Includes alumina used for refractories.

For the last few years it has been impossible to give separate statistics showing the output of either artificial aluminum abrasives or refractories. Some measure of the combined output of these materials made from bauxite may be had from the quantity of bauxite sold to manufacturers, as indicated in the table above. Figures for aluminous abrasives heretofore reported in the chapters on bauxite and aluminum and abrasives in Mineral Resources have included annually increasing quantities of aluminum oxide used as refractory material.

Value of aluminum and aluminum salts made from bauxite, 1921–1925

Year	New aluminum	Aluminum salts
1921	$10,906,000	$7,547,200
1922	13,622,000	8,813,000
1923	28,305,000	8,987,400
1924	37,607,000	9,301,400
1925	36,430,000	13,155,790

TOTAL BAUXITE PRODUCTION OF THE UNITED STATES

The first bauxite produced in the United States was that obtained in 1889 from deposits in the north Georgia field. In 1891 the Alabama deposits made their first production, and practically all the bauxite mined in the United States until 1899 came from these two States. The Arkansas deposits made their first output in 1896, but it was not until 1900 that their influence was felt. In 1907 the Tennessee deposits first began shipments.

The total production of bauxite from the beginning of the industry in 1889 through 1925 was 6,045,394 long tons, valued at $33,513,987. The quantity produced in the period 1889 to 1895, inclusive, was 0.9 per cent of this total, and for the period the average value f. o. b. mines was approximately $3 a ton. In the following decade, 1896 to 1905, 5.2 per cent of the total was produced and the average value was about $4; in the next decade, 1906 to 1915, 25.5 per cent was produced with an average value of about $5; and in the last decade, 1916 to 1925, 68.4 per cent with an average value of about $6.

Bauxite produced in, imported into, and exported from the United States, 1916–1925

Year	Domestic production			Imports for consumption		Exports (including bauxite concentrates)	
	Long tons	Value		Long tons	Value	Long tons	Value
		Total	Average				
1916	425,100	$2,296,400	$5.40	30	$87	17,939	$987,454
1917	568,690	3,119,058	5.48	7,691	28,989	21,791	1,323,926
1918	605,721	3,447,992	5.69	3,653	14,791	19,711	1,523,688
1919	376,566	2,201,747	5.85	6,082	36,820	17,701	1,372,094
1920	521,308	3,247,345	6.23	42,895	251,284	22,257	1,843,596
1921	139,550	889,800	6.38	27,587	164,589	5,942	488,785
1922	309,600	2,012,330	6.50	23,656	93.805	19,617	961,208
1923	522,690	3,156,610	6.04	119,020	593,882	78,560	3,380,486
1924	347,570	2,137,990	6.15	201,974	909,493	77,065	3,979,832
1925	316,540	1,988,250	6.28	353,696	1,549,120	78,633	4,134,455

MARKET AND PRICES

Bauxite finds its market east of Mississippi River, and is sold largely to the manufacturers of aluminum, abrasives, commercial chemicals, and refractories. In 1925 the market for the manufacture of the alumina cements was largely met by imported bauxite. High-alumina (diaspore) clays produced in Missouri are being sold according to their alumina content, and three grades, containing 55, 65, and 70 per cent of alumina (Al_2O_3), are regularly handled. Information on production is given in the Mineral Resources report on clay. In the last few years some of the makers of refractories and of aluminum chemicals have been using clays as a crude material in place of bauxite.

BAUXITE PRODUCERS IN THE UNITED STATES IN 1925

American Bauxite Co., Bauxite, Ark.
Globe Bauxite Co., Joliet, Ill.
Ideal Bauxite Mining Co., Ideal, Ga.
Kalbfleisch Corporation, 200 Fifth Avenue, New York, N. Y.
Republic Mining & Manufacturing Co., 1111 Harrison Building, Philadelphia, Pa.
Southern Bauxite Co., Benton, Ark.
Superior Bauxite Co., Joliet, Ill.
Warner, Porter, Chattanooga, Tenn.
Wright, J. P., R. F. D. 4, Little Rock, Ark.

The largest consumers of bauxite in the United States are also producers, and there is only a small market for what might be called "outside bauxite." Consumers who do not own deposits contract for their supplies for considerable periods, seemingly to assure an adequate supply of bauxite of the grade desired. The price of bauxite at mines or shipping points in 1925, as reported by independent producers, ranged from $5 to $6.41 a ton; the average price reported by all producers for the year was $6.28 a ton f. o. b. mines. Consumers, on the other hand, report prices that average $12.50 a ton f. o. b. plants, a little lower than in 1924.

CONSUMERS OF BAUXITE IN THE UNITED STATES IN 1925

Aluminum Ore Co., East St. Louis, Ill.
Atlas Portland Cement Co., 25 Broadway, New York, N. Y.
Calumet Chemical Co., Joliet, Ill.
The Carborundum Co., Niagara Falls, N. Y.
Charles Lennig & Co. (Inc.), 40 North Front Street, Philadelphia, Pa.
Columbus Water Purification Works, Columbus, Ohio.
Como Chemical Co., Kokomo, Ind.
E. I. du Pont de Nemours & Co., Wilmington, Del.
Exolon Company, 156 Sixth Street, Cambridge, Mass.
General Abrasive Co. (Inc.), Niagara Falls, N. Y.
General Chemical Co., 40 Rector Street, New York, N. Y.
General Refractories Co., Trinity Building, New York, N. Y.
Gulf Refining Co., Frick Building, Pittsburgh, Pa.
Harbison-Walker Refractories Co., Pittsburgh, Pa.
Jarecki Chemical Co., St. Bernard Station, Cincinnati, Ohio.
Kalbfleisch Corporation, 200 Fifth Avenue, New York, N. Y.
Kansas City Water Department, Kansas City, Mo.
Laclede-Christy Clay Products Co., St. Louis, Mo.
Massillon Stone & Fire Brick Co., Massillon, Ohio.
Merrimac Chemical Co., 148 State Street, Boston, Mass.
Metropolitan Water District of Omaha, Nebr.
North Hudson Chemical Co. (Inc.), Albany, N. Y.
Norton Co., Worcester, Mass. (also Niagara Falls, N. Y.).
Passaic Cons. Water Co., 158 Ellison Street, Paterson, N. J.
Pennsylvania Salt Manufacturing Co., Widener Building, Philadelphia, Pa.
Sacramento Pumping and Filtration Works, Sacramento, Calif.
Springfield Waterworks, Springfield, Mass.
Stauffer Chemical Co., 624 California Street, San Francisco, Calif.
Superior Chemical Co., Joliet, Ill.
Trenton Waterworks, Trenton, N. J.
Welch Chemical Co., 8 East Long Street, Columbus, Ohio.

The price of bauxite is regularly quoted in the Engineering and Mining Journal. Crushed bauxite was quoted at $5.50 to $8.50 a ton throughout the year. Dried and pulverized bauxite was quoted at $14, and calcined bauxite at $19 to $20 a ton f. o. b. shipping point. French and Adriatic bauxite was offered at $4 to $7 and Guiana at $8.50 c. i. f. American ports.

Under the tariff act of 1922 crude bauxite is dutiable at the rate of $1 a ton, and alumina hydrate or refined bauxite at half a cent a pound. (See par. 6, schedule 1, and par. 207, schedule 2.)

BAUXITE IN THE UNITED STATES

The bauxite deposits of the United States are in central Arkansas, northeastern and southeastern Alabama, northwestern and west-central Georgia, northeastern Mississippi, and eastern Tennessee.

The bauxite from all localities in the United States, though it may vary in chemical composition, is on the whole similar in general appearance, with the exception of the "granitic bauxite" of the Arkansas field. The greater part of the American bauxite appears to be made up of rounded pebblelike bodies set in a fine-grained matrix, which may also consist of small rounded particles or may be as fine grained as the finest clay. The pebble or pisolite form is so general that it is the conspicuous characteristic of American bauxite.

There is only one way to determine the value of bauxite, and that is by chemical analysis, which should show total silica, alumina, titanium oxide, iron oxide, and water. Bauxites of commercial grade should carry at least 52 per cent of alumina.

Some measure of the relative quality of dried bauxite can be had by grinding a sample in an agate mortar for half a minute (J. M. Hill test). A bauxite of good grade will be found hard to grind and will stick to the mortar with such tenacity that it will have to be scoured out; a poor bauxite or bauxitic clay will grind much more easily and will stick very little, if at all; and clay or kaolin grinds with ease and does not stick to the mortar. Similar results are found if the sample is rubbed on glass; the glass will not be scratched by even high-grade bauxite.

The chief bauxite deposits in the United States have been described in the list of papers below, which, however, is not a complete bibliography of the subject.

ARKANSAS FIELD

BEYER, W. F. B., "Bauxite in Arkansas": Eng. and Min. Jour., Apr. 14, 1904, pp. 606–607.

BRANNER, J. C., "Bauxite in Arkansas": Am. Geologist, vol. 12, pp. 181–183, 1891. Jour. Geology, vol. 5, pp. 263–289, 1897.

HAYES, C. W., "Arkansas bauxite deposits": U. S. Geol. Survey Twentieth Ann. Rept., pt. 3, pp. 441–471, 1901.

MEAD, W. S., "Occurrence and origin of the bauxite deposits of Arkansas": Econ. Geology, vol. 10, pp. 28–54, 1915.

WILLIAMS, J. F., "Igneous Rocks of Arkansas": Arkansas Geol. Survey, Ann. Rept., vol. 2, 1890.

GEORGIA, ALABAMA, AND TENNESSEE FIELD

ASHLEY, G. H., "Bauxite mining in Tennessee": Resources of Tennessee, vol. 1, pp. 211, 219, 1911.

BURCHARD, E. F., "Bauxite in northeastern Mississippi": U. S. Geol. Survey Bull. 750, pp. 101–148, 1925.

HAYES, C. W., "Bauxite": U. S. Geol. Survey Sixteenth Ann. Rept., pt. 3, pp. 547–597, 1895.

——— "The geologic relations of the southern Appalachian bauxite deposits": Am. Inst. Min. Eng. Trans., vol. 24, pp. 243–254, 1895.

MCCALLIE, HENRY, "Alabama bauxite": Alabama Industrial and Scientific Soc. Proc., 1893.

——— "The valley regions of Alabama." pt. 2, pp. 79–84, Alabama Geol. Survey, 1897.

——— "Bauxite deposits of southern Georgia": Eng. and Min. Jour., May 27, 1911, p. 1050.

MORSE, P. F., "The Bauxite Deposits of Mississippi": Mississippi Geol. Survey Bull. 19, 1923.

NELSON, W. A., "Appalachian bauxite deposits": Geol. Soc. Amer. Bull., vol. 34, pp. 525–540, 1923.

PHALEN, W. C., "Production of bauxite and aluminum in 1907": U. S. Geol. Survey Mineral Resources, 1907, pt. 1, pp. 695–698, 1908.

PHALEN, W. C., "Production of bauxite and aluminum in 1912": U. S. Geol. Survey Mineral Resources, 1912, pt. 1, p. 951, 1913.
——— "Production of bauxite and aluminum in 1913": U. S. Geol. Survey Mineral Resources, 1913, pt. 1, pp. 3–10, 1914.
RETTGER, R. E., "The bauxite deposits of southeastern Alabama": Econ. Geol., vol. 20, 1925, pp. 671–685.
SHEARER, H. K., "A report on the Bauxite and Fuller's Earth of the coastal plain of Georgia": Georgia Geol. Survey Bull. 31, pp. 19–140, 1917.
SPENCER, J. W., "The geology of 10 counties of northwestern Georgia," pp. 214–239, 1893. (Published by authority of Georgia Geol. Survey.)
VEATCH, OTTO, "Bauxite of Wilkinson County, Ga.": Georgia Geol. Survey Bull. 18, pp. 430–447, Atlanta, 1909.
WATSON, T. L., "A Preliminary Report on the Bauxite Deposits of Georgia": Georgia Geol. Survey Bull. 11, 1904.
——— "The Georgia bauxite deposits, their chemical constituents, and genesis": Am. Geologist, vol. 28, pp. 25–45, 1901.

VIRGINIA

PHALEN, W. C., "Production of bauxite and aluminum in 1908": U. S. Geol. Survey Mineral Resources, 1908, pt. 1, pp. 698–699, 1909.

Alabama.—No bauxite was produced in Alabama in 1925. There are a number of scattered deposits of bauxite of chemical grade in the Eufaula district, the area between Fort Gaines and Clayton, in Henry and Barbour Counties, which will doubtless be worked when conditions warrant. Rettger [2] described the Eufaula field as covering an area 20 miles long and 10 miles wide, whose center is 13 miles southwest of Eufaula, in which there are some 200 known bauxite occurrences, 60 of which have been tested and 75 others outlined, which contain a fair amount of marketable ore. The deposits are pockets having vertical dimensions approximately equal to the horizontal. The largest pocket is 200 by 100 feet, but most of the ore bodies tested are much smaller and range up to 50 feet deep. Rettger believes that the bauxite resulted from lateritic alteration of kaolins.

Arkansas.—Six companies in Arkansas produced 296,320 long tons of bauxite in 1925, a decrease of 10 per cent as compared with the production of 1924. The deposits in Saline County contributed 93 per cent of the output of the State. The producers, named in the order of output, are American Bauxite Co., Republic Mining & Manufacturing Co., Southern Bauxite Co., Globe Bauxite Co., Superior Bauxite Co., and J. P. Wright.

Allen [3] in a discussion of bauxite mining in Arkansas brings out the point that most of the ore now mined by the American Bauxite Co. lies under more than 20 feet of sand overburden, which necessitates testing with the drill. Holes are spaced 300 feet, center to center, and give adequate data for estimating tonnage of ore and yards of overburden to be moved. Bulk stripping is done with 60 to 70 ton steam shovels, secondary stripping with 20 to 36 ton shovels, and finally a cleaning of the last 18 inches above the bauxite by hand labor. Bauxite is broken by black powder or dynamite loaded in holes 6 to 20 feet deep, placed in lines parallel to the face. Loading is done by caterpiller steam shovels. Since 1924 about 60 per cent of the bauxite produced is mined underground. There are 9 miles of

[2] Rettger, R. E., "The bauxite deposits of southeastern Alabama": Economic Geology, vol. 20, 1925, pp. 671–685.
[3] Allen, L. A., "Bauxite mining in Arkansas": Cement, Mill and Quarry, vol. 27, July 20, 1925, pp. 39–40.

tunnels in the workings, 55 men a day are employed, and 6,000 tons of bauxite a month are produced.

In a review by Anderson [4] the statement is made that at Bauxite, Ark., the underground mining covers an area of 160 acres, where the overburden is 100 feet deep. The main haulage tunnel, 4,000 feet long, is driven along the edge of the ore body, and drifts 20 feet wide on 50 centers are run through the body. The retreating caving system is used.

Georgia.—In 1925 three companies produced bauxite from three counties. The total output was 18,220 long tons, an increase of 13 per cent over the output in 1924. The largest producer was the Republic Mining & Manufacturing Co., which operated mines near Vans Valley, Floyd County, and Irwinton, Wilkinson County. The Kalbfleisch Corporation, which ranked second, operated mines in Macon County near Andersonville. The Ideal Bauxite Mining Co., at Ellaville, Macon County, ranked third.

Mississippi.—No shipments of bauxite were made from the deposits in northeastern Mississippi, which J. W. Adams discovered in 1921.

Tennessee.—The bauxite properties near Chattanooga were not active in 1925. The Perry mine, usually worked by the Kalbfleisch Corporation, was idle, but a near-by deposit was worked by Porter Warner, of Chattanooga.

Utah.—Somewhat over 1,400 tons of by-product alumina from Marysvale, Utah, was used for the manufacture of high-grade aluminous refractories in 1925. Experiments have been carried further looking to the manufacture of aluminum sulphate and potash alum from Utah alunite.

BAUXITE IN FOREIGN COUNTRIES

WORLD'S PRODUCTION

The following table was compiled by L. M. Jones, of the Bureau of Mines, from official sources so far as possible:

World's production of bauxite, 1920–1925, by countries, in metric tons

Country	1920	1921	1922	1923	1924	1925
Austria	362	2,638	4,095	2,734		
France	266,716	95,318	236,141	393,736	335,582	406,535
Germany	13,420	10,122	15,150	6,664	3,085	(a)
Guiana:						
British	31,883	(b)	(b)	[c] 101,957	[c] 156,800	[c] 177,808
Dutch			18,805	15,839	63,097	86,277
Hungary	(a)	(a)	(a)	500	192	(a)
India, British	6,401	6,759	4,998	6,652	23,600	(a)
Ireland, Northern	11,197	2,305	5,953	3,504	5,241	(a)
Italy	13,139	49,120	66,645	98,055	140,790	195,000
Rumania	(a)	(a)	3,737	4,162		(a)
Spain	540	184				
United States	529,675	141,790	314,569	531,079	353,148	321,620
Yugoslavia	27,860	10,021	31,290	32,631	18,485	79,032

[a] Data not available.
[b] Early in 1921 operations at the bauxite mines were discontinued, and the mines remained closed until late in 1922. Shipments of 20,010 tons were made from stocks in 1921. No shipments were made in 1922.
[c] Exports.

[4] Anderson, R. J., "Bauxite mining largely by open-pit methods": Eng. and Min. Jour.-Press, vol. 121, Mar. 6, 1926, p. 403. Original in Min. Jour. (London), vol. 34, March, 1926, pp. 137–147.

Africa.—Deposits of high-grade bauxite not far from transportation in the Gold Coast Colony have recently been described by Kitson [5] as containing reserves of more than 26,500,000 tons. Dixey [6] has said that in Nyasaland Colony there are reserves of more than 20,000,000 tons of low-silica bauxite, carrying 57 to 60 per cent alumina.

France.—Production of bauxite in France in 1925 was 406,535 metric tons. During the first quarter of 1925 [7] exports had declined about one-third, apparently because of the increasing domestic demand for high-alumina cement. It is not expected that the French Government will restrict exportation of bauxite, though there was some talk of this step, due to the greatly increased demands by the makers of metal, cement, and abrasives.

Guiana.—The exports of bauxite from British Guiana in 1925 were 177,808 metric tons, practically all of which was sent to the United States. Emory [8] has given further details of the bauxite mining operations in British Guiana. A syndicate known as the Combined British Aluminum Interests is examining the remaining Crown lands in the Colony and will undoubtedly be given concessions on any bauxite it may develop, for the British Government was back of the formation of the syndicate.

In Dutch Guiana [9] a study of the Marowyne River was made and there is possibility of developing 200,000 horsepower of hydroelectric energy at some falls 100 miles south of Albina. The exports of bauxite from the Dutch Colony in 1925 were 85,525 metric tons, valued at $256,157. It is understood that the largest producer in Dutch Guiana is now installing a large crushing and drying plant.

Hungary.—Doctor Szabo [10] mentions the various deposits in Hungary at the north end of Lake Balaton, in the Vertes Mountains, and estimates that the reserves are about 30,000,000 tons. The bauxite, however, is high in silica.[11]

Yugoslavia (Montenegro).—A company [12] has been organized at Spalato to hold concession for a newly discovered bauxite deposit between Bar and Ulcin, 9 kilometers from the Bay of Mrkovac.

ALUMINUM

DOMESTIC PRODUCTION—IMPORTS AND EXPORTS

The value of the new aluminum produced in the United States in 1925 was 3 per cent less than in 1924, and the value of the secondary aluminum was 70 per cent greater.

According to statistics collected by J. P. Dunlop, of the Bureau of Mines, secondary aluminum was recovered to the amount of 17,700 short tons as metal and 26,300 short tons as the aluminum content of casting alloys. The total recovery was 44,000 short tons.

---

[5] Kitson, A. E., "Bauxite deposits of the Gold Coast": Min. Mag. (London), vol. 33, November, 1925, pp. 265–270.
[6] Dixey, F., "Bauxite deposits in Nyasaland"; Min. Mag. (London), vol. 33, October, 1925, pp. 201–205.
[7] Commerce Repts., June 29, 1925, p. 773.
[8] Emory, L. T., "Diamond and bauxite mining active in British Guiana": Eng. and Min. Jour.-Press, vol. 120, Oct. 3, 1925, pp. 525–528.
[9] Eng. and Min. Jour.-Press, vol. 121, Feb. 27, 1926, p. 381.
[10] Szabo, Ladislas, "Mineral industry prospects in Hungary": Min. Jour. (London), vol. 148, 1925, p. 254.
[11] Commerce Repts., Mar. 16, 1925, p. 637.
[12] Chem. and Met. Eng., vol. 32, December, 1925, p. 959.

***Value** of aluminum produced in, imported into, and exported from the United States, 1916–1925*

Year	Domestic production		Imports [2]	Exports [3]
	Primary metal	Secondary metal [1]		
1916	$33,900,000	$23,430,200	$1,785,870	$15,417,134
1917	45,882,000	16,711,800	56,890	14,586,467
1918	41,159,000	10,113,600	554,586	10,869,388
1919	38,558,000	12,014,600	4,568,595	3,890,326
1920	41,375,000	9,489,100	13,077,022	5,630,781
1921	10,906,000	3,775,400	8,889,791	3,108,857
1922	13,622,000	6,085,900	9,695,012	2,836,116
1923	28,305,000	10,824,600	8,742,563	3,571,539
1924	37,607,000	14,596,200	7,145,036	4,172,390
1925	36,430,000	24,816,000	10,106,767	6,057,071

[1] Value of secondary aluminum based on average price at New York as given by American Metal Market.
[2] Imports for consumption include aluminum in crude form, scrap, bars, strips, rods, plates, sheets, and all manufactures of aluminum.
[3] Exports include ingots, metal and alloy, plates and sheets, and all manufactures of aluminum.

The following tables show the forms in which most of our aluminum is imported and exported. The bulk of the imported aluminum is in crude and semicrude form.

Aluminum imported for consumption in the United States, 1924–25

Class	1924		1925	
	Pounds	Value	Pounds	Value
Crude and semicrude:				
Crude form, scrap, alloy, etc	30,997,371	$6,640,192	41,894,838	$9,757,771
Plates, sheets, bars, strips, rods, coils, and blanks	203,153	62,189	101,463	47,501
Circles, disks, rectangles, and squares	609,417	157,404	877	373
	31,809,941	6,859,785	41,997,178	9,805,645
Manufactures:				
Tubes, moldings, castings, and other shapes	85	70	475	425
Leaf (5½ by 5½ inches)	[1]	25,420	[1]	30,660
Powder, powdered foil	88,113	38,230	65,805	33,837
Foil less than 0.006 inch thick	25,527	18,864	79,668	64,658
Table, kitchen, and hospital utensils and other similar hollow ware	335,785	152,675	255,005	126,404
All other manufactures	74,135	49,992	47,070	45,138
		285,251		301,122
Grand total		7,145,036		10,106,767

[1] 1924, 1,959,266,300 leaves; 1925, 2,129,169,500 leaves; equivalent in pounds not recorded.

About 66 per cent by weight of the exports in 1925 consisted of crude and semicrude forms, as compared with 48 per cent in 1924.

Domestic aluminum exported from the United States, 1924–25

Class	1924		1925	
	Pounds	Value	Pounds	Value
Crude and semicrude:				
Ingots, scrap, and alloys	3,356,786	$703,996	8,130,222	$1,835,213
Plates, sheets, bars, strips, and rods	2,986,726	928,319	4,511,812	1,530,602
	6,343,512	1,632,315	12,642,034	3,365,815
Manufactures:				
Tubes, moldings, castings, and other shapes	3,574,427	1,098,578	3,572,167	1,195,658
Table, kitchen, and hospital utensils	1,026,593	570,842	994,461	629,417
Other manufactures of aluminum	2,182,220	870,655	1,896,564	866,181
	6,783,240	2,540,075	6,463,192	2,691,256
Grand total	13,126,752	4,172,390	19,105,226	6,057,071

MARKET AND PRICES

Quotations on virgin aluminum, as given by the Engineering and Mining Journal-Press, were 28 cents a pound for the 99 per cent grade on January 1 and remained at that level until October 31, when an increase of 1 cent was announced. The 98 per cent domestic grade was 1 cent a pound cheaper. Foreign and secondary aluminum was sold at 1 to 2 cents a pound below the domestic figures for similar grades.

The Aluminum Co. of America reported that the demand for the metal held up well and was fully met either from domestic production or from imports. The severe drought in the East in 1925 forced the curtailment of output of the Alco (Tenn.) and Badin (N. C.) plants. The growth in the use of aluminum paints for both outside and inside work has continued, and railroads are building or have built cars in whose construction as much aluminum as possible has entered.

The development of aluminum alloys, particularly for the automotive industry, has necessitated much research work that has been reflected in the technical press by a large number of papers. Some of the more important of these papers are listed below:

Anderson, R. J., "Aluminum alloys for piston castings must meet varied requirements": Automotive Industries, December 17, 1925, pp. 1030–1034.

——— "Smelting secondary aluminum and aluminum alloys": Metal Industry, vol. 24, February, 1926, pp. 63–65.

Archer, R. S., and Jeffries, Zay, "New developments in high-strength aluminum alloys": Trans. Amer. Inst. Min. and Met. Eng., vol. 71, 1925, pp. 828–863.

——— and Kempf, L. W., "Modification and properties of sand-cast aluminum-silicon alloys": Amer. Inst. Min. and Met. Eng. Pamphlet 1544E, 1926.

Comstock, G. E., "Hardness of heat-treated aluminum bronze": Trans. Amer. Inst. Min. and Met. Eng., vol. 71, 1925, pp. 806–815.

Daniels, S., Lyon, A. J., and Johnson, J. B., "Casting and heat treatment of some aluminum-copper-magnesium alloys": Trans. Amer. Inst. Min. and Met. Eng., vol. 71, 1925, pp. 864–888.

Dix, E. H., and Richardson, H. H., "Equilibrium relations in aluminum-copper alloys of high purity": Amer. Inst. Min. and Met. Eng. Pamphlet 1534E, 1926.

Flick, F. B., "Etching aluminum and its alloys for macroscopic and microscopic examination": Trans. Amer. Inst. Min. and Met. Eng., vol. 71, 1925, pp. 816–827.

HIDNERT, PETER. "Thermal expansion of aluminum and various important aluminum alloys": Bureau of Standards Sci. Paper 497, 1925.
MCADAMS, D. J., "Endurance properties of nonferrous metals": Amer. Inst. Min. and Met. Eng. Pamphlet 1537D, 1926.
MEISSNER, K. L., "The microstructure of aluminum": Amer. Inst. Min. and Met. Eng. Pamphlet 1509E, 1926.
STOUGHTON, BRADLEY, and MIYAKE, M. A., "A preliminary study of magnesium base alloys": Amer. Inst. Min. and Met. Eng. Pamphlet 1538E, 1926.

FOREIGN ALUMINUM INDUSTRY

Canada.[13]—The new $70,000,000 plant of the Northern Aluminum Co., subsidiary of the American Aluminum Co., at Chute à Caron, Quebec, is progressing rapidly and is expected to be in production by the end of the year (1926). Power will be purchased from the Duke power plant on the Saguenay River, which eventually will furnish 500,000 to 600,000 horsepower.

England.[14]—Apparently the English aluminum industry was more active than in 1924. Exports from England in 1925 were 3,744 tons of aluminum ingots and 3,144 tons of aluminum sheet, as compared with 2,966 and 2,049 tons, respectively, in 1924. The North British Aluminum Co. (Ltd.)[15] has recently issued shares for the development of a 100,000-horsepower plant at Fort William. The total cost of the hydroelectric installation and plant for making aluminum is estimated at £5,000,000.

France.—Production of aluminum in France in 1924 was 18,500 metric tons and exports 19,300 tons, as compared with 17,000 and 17,900 tons in 1923.[16] During the first six months of 1925 the exports of aluminum from France were 9,632 metric tons, or only about 73 per cent as much as in the same period of 1924.[17] A new aluminum plant is to be built by Cie. Alais, Forges et Camargue, at Beyrede, and a new hydroelectric installation at Poet, on the Durance River, will supply a new chlorate and aluminum plant at Saint-Auban.[18]

Germany.—Germany imported 209,703 metric tons of bauxite in the first nine months of 1925, mostly from France and Italy (Istria), as compared with 35,385 tons in the same period of 1924.[19] She imported 5,471 metric tons of aluminum in 1924 and her consumption of the metal in 1924 was one-third larger than in 1911.[20] Her imports of aluminum in 1925 were largely from Switzerland and Norway.[21] The Rheinfelden Werke, Baden, produced 20,000 tons of aluminum in 1924. The new plant at Toeging, on the Inn River, Bavaria, is now in operation, producing 1,000 tons a month.[22] During the first half of 1925 German imports of aluminum were 6,523 tons, notwithstanding the large increase in domestic production.[23]

---

[13] Commerce Repts., Dec. 14, 1925, p. 654. Jour. du four électrique, 34th year, Nov. 1, 1925, pp. 205–206; 35th year, Feb. 15, 1926, p. 36; Eng. and Min. Jour.-Press, vol. 120, Aug. 8, 1925, p. 224; vol. 121, Apr. 10, 1926, p. 593.
[14] Jour. du four électrique, 34th year, Jan. 15, 1925, p. 3; 34th year, Mar. 15, 1925, p. 53; 35th year, Feb. 15, 1926, p. 35.
[15] Mining Magazine (London), vol. 32, March, 1925, p. 136.
[16] Commerce Repts., Feb. 8, 1926, p. 348.
[17] Jour. du four électrique, 34th year, Sept. 1, 1925, p. 172.
[18] Jour. du four électrique, 34th year, June 15, 1925, pp. 123–124.
[19] Jour. du four électrique, 34th year, Nov. 15, 1925, p. 216.
[20] Commerce Repts., May 11, 1925, p. 343.
[21] Commerce Repts., May 25, 1925, p. 481.
[22] Commerce Repts., July 6, 1925, p. 40.
[23] Commerce Repts., Sept. 14, 1925, p. 625.

Italy.—It is reported [24] that the increase in capital of the Société de Montecatini is in part to be used for an aluminum works in south Italy. The Société des forces hydro-électriques de la Sila will furnish power for a new aluminum plant at Cotrone, Calabria.[25]

Spain.—The Bank of Urquijo is reported to be backing a new Madrid company, capitalized at 4,000,000 pesetas, which will build an aluminum plant at Sabifianigo, Huesca.[24]

ALUMINUM SALTS

Manufacturers of aluminum salts report a consumption during 1925 of 122,340 long tons of bauxite, having an average value of $12.50 a ton at the plants, and an unrecorded quantity of high-alumina clay, as compared with 106,150 tons of bauxite and an unrecorded though large quantity of high-alumina clay in 1924. These figures do not include the bauxite made into alumina as a preliminary step in the manufacture of aluminum.

Aluminum salts produced in the United States, 1924–25

Salt	1924				1925			
	Number of producers reporting	Short tons	Value		Number of producers reporting	Short tons	Value	
			Total	Average			Total	Average
Alum;								
Ammonia	5	4,920	$333,770	$68	5	4,750	$308,750	$65
Sodium	4	13,920	765,740	55	4	14,450	838,100	58
Alumina, calcined and hydrate	4	5,540	408,160	74	4	4,490	321,850	72
Aluminum chloride	3	5,510	724,430	131	4	12,830	4,012,920	313
Aluminum sulphate:								
Commercial—								
General	19	250,630	6,274,850	25	14	276,210	6,905,250	25
Municipal	6	5,690	89,160	-------	6	6,240	129,600	-------
Iron-free	7	15,570	673,470	43	7	16,140	613,320	38
Other aluminum salts	-------	410	31,830	-------	-------	370	26,000	-------
	-------	302,190	9,301,410	-------	-------	335,480	13,155,790	-------

Aluminum salts produced in, imported into, and exported from the United States, 1921–1925

Year	Domestic production		Imports		Exports [a]	
	Short tons	Value	Short tons	Value	Short tons	Value
1921	184,813	$7,547,184	1,009	$45,963	(a)	(a)
1922	281,480	8,812,987	2,889	116,971	13,225	$388,447
1923	289,904	8,987,421	2,318	120,663	17,805	505,732
1924	302,190	9,301,410	2,523	113,075	16,012	407,749
1925	335,480	13,155,790	3,205	140,518	20,756	505,537

[a] Exports not separately shown prior to 1922. Figures for 1922 to 1925 represent aluminum sulphate only.

[24] Jour. du four électrique, 34th year, Oct. 15, 1925, p. 199.
[25] Jour. du four électrique, 34th year, Nov. 15, 1925, p. 217.

Tilley, Millar, and Ralston[26] have recently reviewed at length the various processes for the recovery of alumina from high-silica materials, such as clay and alunite. They propose a method of treating such materials with sulphuric acid, which they believe will produce alumina at a cost about equal to or less than the Bayer process of recovering alumina from bauxite.

Phillips[27] has discussed at length the use of aluminum chloride in the dye industry, and states that for the preparation of vat dyes synthetic anthraquinone made from aluminum chloride is superior to that made from anthracene because of the purity of the dye. This use has been possible only since aluminum chloride cost 15 cents a pound or less.

ALUMINOUS ABRASIVES AND REFRACTORIES

High-alumina refractories are finding a wider market. That their production is expanding is shown by the growing demand for high-alumina clays and other aluminous minerals by ceramists throughout the country. In 1925 the makers of refractory brick took 260 long tons of bauxite and 15,177 short tons of high-alumina (diaspore) clay. Increasing quantities of andalusite and dumortierite, the newly applied aluminous raw materials, were shipped from deposits in California and Nevada during 1925.

ALUMINA CEMENTS

Although producers reported no sales of domestic bauxite to makers of high-alumina cement, it is known that a large quantity of foreign bauxite was consumed by this new industry. Thomas[28] recently described the use of these quick-setting cements in oil-well work in California.

---

[26] Tilley, G. S., Millar, R. W., and Ralston, O. C., Acid Processes for the Extraction of Alumina": Bulletin 267, Bureau of Mines. (In course of publication.)

[27] Phillips, Max, "Use of aluminum chloride in the dye industry": Chem. and Met. Eng., vol. 33, March, 1926, p. 173.

[28] Thomas, C. C., "Use of quick-setting cements in oil wells": California Oil Fields (Summary of operations), vol. 11, October, 1925, pp. 5–13.

ARSENIC

By V. C. Heikes [1]

PRODUCTION

Six arsenic plants operated by four companies produced 12,119 short tons of white arsenic in the United States during 1925. The total sales of arsenic included this output and a little from the stock of arsenic on hand, amounting in all to 12,317 tons. This total covered 11,240 tons of refined white arsenic, valued at $1,122,475, or 4.99 cents a pound, and 1,077 tons of crude arsenic, selling for $76,772, or 3.56 cents a pound. Insecticide manufacturers purchased about 60 per cent of the total output of white arsenic, the glass industry 25 per cent, and the remainder, most of it crude and some refined, was used in making weed-killer solution at point of production. Small quantities of arsenic were sold to farmers for killing grasshoppers and rodents.

The table below includes the production of white arsenic from all sources in the United States since the first output made at Everett, Wash., in 1901.

Crude and refined white arsenic sold by producers in the United States and imported, 1901–1925

Year	Sales of domestic product				Imports for consumption		
	Short tons		Value		Short tons	Value	
	Refined	Crude	Total	Average (cents per pound)		Total	Average (cents per pound)
1901–1918	[a] 46,239	705	$4,506,786	4.8	[b] 24,939	[b] $2,332,681	4.7
1919	[a] 6,029	----------	1,181,684	9.8	4,389	624,494	7.1
1920	10,942	560	2,021,356	8.8	3,740	532,635	7.1
1921	3,427	1,359	717,700	7.5	1,669	253,250	7.6
1922	8,905	1,122	1,475,229	7.4	1,081	162,494	7.5
1923	12,357	1,914	2,808,801	9.8	10,152	1,985,400	9.8
1924	12,270	2,183	2,655,015	9.2	8,877	1,597,433	9.0
1925	11,240	1,077	1,199,247	4.9	9,316	1,076,073	5.8

[a] Part of the output in 1918 and 1919 was elemental arsenic, but the elemental arsenic produced in 1920 and 1921 is not included in the table, as it was reduced from white arsenic purchased on the market. No elemental arsenic was produced from 1922 to 1925.

[b] Imports for 1901 and 1902 (7,550 tons, valued at $596,580) include also arsenic sulphide. Separate figures not available.

[1] Figures on imports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

IMPORTS

Arsenic compounds (other than white arsenic) imported for consumption in the United States, 1919–1925

Year	Arsenic sulphide (realgar and orpiment)		Sheep dip		Paris green and London purple	
	Short tons	Value	Pounds	Value	Pounds	Value
1919	2,151	$316,687	146,803	$12,346	18	$14
1920	4,080	684,016	70,168	5,150	772	277
1921	3,343	531,322	61,377	6,362	325	123
1922 [1]	3,815	472,044	70,390	4,877	3,866	741
1923 [2]	1,097	268,311	87,739	5,237	100,781	20,586
1924 [3]	234	45,246	114,801	10,764	76,241	15,683
1925 [4]	476	63,296	73,477	4,953	2,880	702

[1] Also 41,296 pounds of "acid," valued at $4,195, and 22,487 pounds of "metallic arsenic," valued at $3,484, imported Sept. 22 to Dec. 31, 1922. Not separately classified prior to new tariff.

[2] Also 166,354 pounds of "acid," $15,597; 174,415 pounds of "metallic arsenic," $37,314; and 26 pounds of "lead arsenate," $9.

[3] Also 420 pounds of "acid," $121; 122,467 pounds of "metallic arsenic," $23,684; 3,585 pounds of "lead arsenate," $525; and 3,172 pounds of "calcium arsenate," $278.

[4] Also 59,112 pounds of "acid," $2,676; 149,018 pounds of "metallic arsenic," $31,918; 10,467 pounds of "lead arsenate," $1,514; and 1,074 pounds of "calcium arsenate," $135.

White arsenic imported into the United States in 1925, by countries and districts

[General imports]

Country	Short tons	Value		District	Short tons	Value
		Total	Average (cents per pound)			
Belgium	38	$3,863	5.0	Massachusetts	6	$1,072
Bolivia	85	10,850	6.4	Buffalo	350	23,248
Canada	1,015	98,912	4.9	New York	5,870	759,132
China	81	5,606	3.5	Philadelphia	194	26,269
Germany	803	86,262	5.4	Maryland	391	29,560
Hongkong	20	1,508	3.8	Galveston	123	7,553
Japan	2,151	168,348	3.9	San Antonio	273	28,883
Mexico	5,058	695,108	6.9	El Paso	580	68,794
Netherlands	60	5,055	4.2	Los Angeles	38	3,213
United Kingdom	5	556	5.0	San Francisco	848	55,256
				Oregon	11	907
	9,316	1,076,073	5.8	Washington	8	627
				Montana-Idaho	374	45,546
				Ohio	250	26,013
					9,316	1,076,073

ARSENIC MARKET IN 1925

DEMAND AND SUPPLY

Only by-product arsenic plants belonging to three smelting companies and one mining company were producing white arsenic in the United States during 1925. These plants are situated at Tacoma, Wash., Globe, Colo., Perth Amboy, N. J., Midvale, Utah, and Anaconda and Jardine, Mont. At the Jardine plant, which is connected with amalgamation and cyanidation works, arsenic is recovered as a by-product in the treatment of arsenical gold ores. All of these plants were built or were enlarged in 1923 when the demand for arsenic was the greatest, and no increase in the total quantity of ore treated was necessary to enable the imported and domestic supply to fill consumers' demands in the United States. About half of the arsenic produced came from the smelting of lead ores, the other half from copper smelting plants and from the Jardine gold mill. The chief sources of domestic arsenic were Utah and Montana, where it was recovered from miscellaneous ores and concentrates by the American Smelting & Refining Co., the United States Smelting, Refining & Mining Co. (Inc.), the Anaconda Copper Mining Co., and the Jardine Mining Co.

Imports during 1925 were 9,316 short tons of crude and refined arsenic. As the production was 12,119 tons, the total new supply in the United States was 21,435 tons; this with the stock on hand of about 6,700 tons made 28,135 tons of white arsenic available.

The only companies which produced ore that was sold in 1925 for its arsenic content were the Western Utah Copper Co. and the United States Smelting, Refining & Mining Co., at Gold Hill, Utah. This ore, little of which was mined in 1925, was shipped to the smelters and stock piled for future treatment. The output of arsenical ore of the Gold Hill mines decreased from 35,444 tons in 1924 to 3,045 tons in 1925. The Western Utah Copper Co. also shipped monthly an average of about 1,000 tons of lead-silver ore containing a little arsenic and considerable iron to the lead furnaces at Murray, Utah. Experimental work in the manufacture of weed killer and Paris green from fume recovered from a 2-ton roasting plant at Sapinero,Colo.,was reported by the White Iron Ores & Products Co.

PRICES

From the high quotation in January of 6¼ cents a pound for white arsenic in New York the quoted price dropped gradually until December, when it was 3½ cents.

WORLD'S PRODUCTION

Imports into the United States in 1925 continued at about the same rate as in 1924, most of the white arsenic coming from Mexico, Japan, Canada, and from ports in Germany. The imports, by months, aggregated more than 1,000 short tons in January and June, but gradually

dwindled to 235 tons in December. The principal countries producing white arsenic are shown in the accompanying table, but the figures for 1925 are not available:

World's production of arsenic ore and white arsenic, 1920–1924, in metric tons

[Compiled by L. M. Jones, of the Bureau of Mines]

Country	1920	1921	1922	1923	1924
ORE					
Australia:					
New South Wales	(1)	1,117	(1)	11,677	4,487
Queensland (arsenical pyrites)	(1)	(1)	2,596	(1)	(1)
South Australia					69
Victoria	(2)	(2)	(2)	(1)	(1)
Western Australia (ore exported)	1,793	7	1,092		
Austria (arsenical pyrites)	[3] 46	1,210	4,671	3,859	6,187
Belgium	(2)	(3)	(1)	(1)	(1)
Brazil	(1)	(1)	(1)	(1)	(1)
Canada	(1)	(1)	(1)	(1)	(1)
China (exports of realgar)	472	258	549	413	472
Chosen	(2)	(2)	56	26	
Czechoslovakia (arsenical pyrites)				24	217
France	3,736	5,087	4,465	10,022	10,552
Germany	6,281	7,033	8,750	10,273	10,818
Greece	(1)	(1)	(1)	(1)	(1)
Italy		60	450	206	147
Japan	2,173	1,506	2,295	[4] 4,245	7,416
Mexico	(1)	(1)	(1)	(1)	(1)
Norway				577	
Portugal	62	11	106	160	279
Rhodesia, Southern	(1)	(1)	(1)	(1)	(1)
Spain (arsenical pyrites)	1,000				
Switzerland	(2)	39	10	100	(2)
Turkey	14	(2)	200	(2)	(2)
Union of South Africa	(1)	(1)	(1)	(1)	(1)
United Kingdom (arsenical pyrites)	1,197	(1)	360	741	304
United States	(1)	(1)	(1)	(1)	(1)
WHITE ARSENIC					
Australia:					
New South Wales	71	403	296	367	328
Queensland	310	224	406	620	573
South Australia					(5)
Victoria	(2)	(2)	(2)	1,036	437
Western Australia	(5)	(5)	(5)		
Austria [6]	7	38	103	136	256
Belgium	(7)	(7)	1,008	1,380	1,850
Brazil	127	127	154	162	146
Canada	2,231	1,353	2,337	2,912	2,096
China (exports)	49	100	30	176	237
Chosen	(2)	(2)	(5)	95	
Czechoslovakia				(5)	(5)
France	447	216	266	815	(5)
Germany [8]	2,077	2,342	2,958	3,363	3,499
Greece	854	768	967	1,176	1,096
Italy		(5)	(5)	(5)	(5)
Japan	933	1,395	1,922	4,287	3,703
Mexico	[1] 2,183	785	[10] 272	1,402	1,293
Norway				(5)	
Portugal	653	268	604	887	874
Rhodesia, Southern	396	327	451	774	533
Spain	76				
Switzerland	(2)	(5)	(5)	(5)	(2)
Turkey	(5)	(2)	(5)	(2)	(2)
Union of South Africa	10	2	3	5	96
United Kingdom	2,029	1,049	994	1,631	3,258
United States	10,434	4,342	9,096	12,946	13.111

[1] White arsenic reported.
[2] Data not available.
[3] Arsenic slimes produced from one gold mine in Salzburg.
[4] Incomplete figure.
[5] Ore reported
[6] Estimated arsenic content of slimes in 1920 and of ore in other years.
[7] Data of production not available. Declared exports of arsenic from Belgium to the United States were as follows: 1920, 463 tons; 1921, 485 tons. No statement was made as to how much of this was of Belgian origin.
[8] Estimated arsenic content of ores and concentrates sold.
[9] Output of Mapimi smelter. Data furnished by company.
[10] Figures of Mexican Government. The Peñoles Co. reports 335 tons shipped in 1922.

MERCURY

By J. W. Furness[1]

INTRODUCTION

The domestic consumer of mercury is becoming more and more dependent upon foreign sources of supply. Prior to 1911 exports had in the main greatly exceeded imports, in 1911 the imports of mercury into the United States exceeded the exports by 6,001 flasks, and during the period 1911 to 1925 imports have gradually increased.

There are no records available as to the production of mercury in the United States prior to 1850. The earliest record of mining mercury in the territory now included in the United States proper is that of the New Almaden mine in Santa Clara County, Calif., which was first worked in 1824, during the Mexican régime. The total domestic production from 1850 to 1925 was 2,412,730 flasks. Of this total California has contributed 2,286,057 flasks.

The history of the production of mercury in this country during the past 75 years illustrates the influence of price upon production and the meaning of economic exhaustion. During the period mentioned prices have ranged from $25 to $300 a flask. During the last five years the price has been ascending; it rose sharply in 1925 as compared with 1924. Production, however, decreased more than one-half in 1921, and although it increased slightly thereafter it decreased again in 1925.

The easily accessible high-grade ores have been exhausted, as is shown by the gradual decrease in mercury content of the crude ores mined. This decrease has been accompanied by improvements in technology. The losses in the furnace practice of early days have been greatly reduced. Ores as low as 0.18 per cent mercury have been successfully treated during the period of high prices.

The industry has passed through the various stages of mining. Old mines that had been abandoned because of the grade of the ore have been reopened and exhausted at the then current prices and old mine dumps worked and tailing ponds from pan amalgamation worked over for their mercury content. From 1915 to 1918 virtually all of the waste dumps, the accumulations of 65 years, were worked over. In the past 25 years, with the exception of the Terlingua district of Texas, no discoveries of major importance have been made, and there seems little hope that such discoveries of mercury will be made, for the country has been carefully prospected. At present two new districts are being developed in the United States, and their potential reserves are not large.

[1] Figures on domestic production compiled by H. M. Meyer and those on imports and exports, from records of the Bureau of Foreign and Domestic Commerce, by J. A. Dorsey, both of the Bureau of Mines.

In the event, however, of the economic exhaustion of foreign sources, domestic mining may again furnish an appreciable contribution to the world's production of this metal.

Since 1850 the world's largest per annum production, 126,000 flasks, was made in 1896, when the average price was $35. In 1881, 122,500 flasks were produced, when the average was $28.50, and in 1912, 122,259 flasks were produced, when the average at New York was $42.46. Since 1912 the price has in the main and except for the postwar slump been ascending and the world's consumption has been decreasing. The world's production in 1925 was approximately 104,000 flasks, and the average price was $83.13 at New York. This brings out the fact that the quantity of mercury produced bears an intimate, but not a direct, relation to the selling price. High prices not only tend to stimulate the production of the metal, but also to restrict consumption for certain purposes. With almost all other metals, a decrease in price has a tendency to greatly increase the consumption, but this relation between price and consumption is not so direct for mercury. The low value of the metal, in spite of the fact of its comparative rarity, is due to restricted demand. The uses of mercury are rather diversified, but the amount used to satisfy any of these demands is extremely small. In comparison with the quantities produced, mercury is the cheapest of metals, and therefore the value of the total production is small.

The average tenor of the recovered mercury in the domestic ores treated in 1925 was 0.5 per cent. The tenor of the ore treated in Italy during the same year was 0.7 per cent; of that treated in Spain, 6 per cent. A comparison between Spain and the United States shows that in the United States it requires 12 times as much material to produce a flask of mercury as it does in Spain. It seems evident that domestic producers of mercury, laboring under the handicap outlined, can not successfully compete with Spanish production. This conclusion lends weight to the statement made by Ransome.[2]

It is doubtful whether there is any wisdom in attempting to foster quicksilver mining by a high import duty whose effect would be to levy a tax on all users of quicksilver for the benefit of a small group of producers, and it is still more doubtful whether the people of the United States would submit to this tax. It has been urged that as quicksilver is essential in warfare the mining of quicksilver should be stimulated by tariff protection. This might be an excellent argument were our quicksilver supplies without limit, but inasmuch as they are in process of exhaustion it is difficult for one who looks at the question impartially to see why the Government should hasten the approach of that day when there shall be no more quicksilver ore to mine rather than purchase quicksilver where it can be bought cheaply, store it as an immediately available reserve supply against the next war, which it is hoped may never come, and rely as a final resource upon those mines in which some ore, that would have been taken out under sufficient governmental encouragement, may yet remain to be of service in a great emergency.

DOMESTIC PRODUCTION

In 1925 the domestic production of mercury in the United States amounted to 9,174 flasks, valued at $762,616, compared with 10,085 flasks, valued at $692,739, in 1924, a decrease of 9 per cent in quantity but an increase of 10 per cent in value. During the five-year period 1909 to 1913, the average yearly production of the United

[2] Ransome, F. L., "Quicksilver"; chapter in Our Mineral Supplies: U. S. Geol. Survey Bull. 666, 1919, p. 8.

States was 21,600 flasks, valued at $952,000, approximately 2.35 times the production of 1925 at only a little over one-half the price received in that year.

California produced 83 per cent of the total for the country in 1925, and from 1850 to 1925 produced 95 per cent of the total for the country. The remainder of the production in 1925 was made by Texas, Nevada, Arizona, and Idaho.

The average tenor of ore treated in 1925 was 0.5 per cent, the same as in 1924.

Mercury produced in the United States, 1916–1925

	Producing mines	Ore treated (short tons)	Mercury obtained		
			Weighted mean percentage tenor	Flasks of 75 pounds	Value
1916	66	249,732	0.45	29,932	$3,768,139
1917	51	280,484	.48	36,159	3,808,266
1918	47	415,654	.30	32,883	3,863,752
1919	34	188,673	.42	21,415	1,933,560
1920	17	109,230	.46	13,392	1,066,807
1921	11	34,850	.63	6,339	300,595
1922	10	43,084	.51	6,375	368,348
1923	14	50,796	.59	7,937	521,302
1924:					
California	6	59,402	.48	[1] 7,966	547,185
Texas, Nevada, Arizona, Oregon, and Idaho	[2] 7	10,789	[3] .59	[2, 4] 2,119	[2] 145,554
	[2] 13	70,191	.50	[2] 10,085	[2] 692,739
1925:					
California	7	58,723	.49	[5] 7,614	632,936
Texas, Nevada, Arizona, and Idaho	6	6,655	.66	[6] 1,560	129,680
	13	65,378	.50	9,174	762,616

[1] Includes 214 flasks obtained from clean-ups, etc., not considered in calculating percentage tenor.
[2] Revised figures.
[3] Takes into account a small amount left in condensers at one mine, not included in production.
[4] Includes 471 flasks obtained from an unknown quantity of ore, not considered in calculating percentage tenor.
[5] Includes 2 flasks obtained from clean-ups, etc., which does not affect the percentage tenor.
[6] Includes 395 flasks obtained from clean-ups, etc., not considered in calculating percentage tenor.

PRICES

Average yearly prices of mercury in the United States and the United Kingdom, 1913–1925

[Per flask of 75 pounds]

Year	San Francisco (domestic) [1]	New York [2]	London [3]			Year	San Francisco (domestic) [1]	New York [2]	London [3]		
			£	s.	d.				£	s.	d.
1913	$40.23	$39.54	7	9	2	1920	$79.66	$81.12	20	14	9
1914	49.05	48.31	[4] 7	15	0	1921	47.42	45.46	11	3	5
1915	85.80	87.01	14	10	8	1922	57.78	58.95	11	11	6
1916	125.89	125.49	17	2	10	1923	65.68	66.50	10	4	9
1917	105.32	106.30	22	4	3	1924	68.69	69.76	11	19	8
1918	117.50	123.47		([5])		1925	82.67	83.13	13	17	1
1919	90.29	92.15	20	9	5½						

[1] Min. and Sci. Press, San Francisco.
[2] Eng. and Min. Jour., New York.
[3] Min. Jour. (London).
} Eng. and Min. Jour.-Press, 1922–1925
[4] Metal exchange closed about three months after outbreak of war. Average based on 37 weeks only.
[5] Quoted as "nominal" only.

Prices of domestic mercury at San Francisco, 1922–1925, by months[1]

[Per flask of 75 pounds]

Month	1922	1923	1924	1925	Month	1922	1923	1924	1925
January	$48.50	$71.05	$59.56	$81.16	July	$54.55	$66.25	$71.70	$82.71
February	47.65	69.20	59.53	80.90	August	56.15	65.01	71.47	82.50
March	48.65	69.53	61.27	80.85	September	63.95	61.87	71.54	81.28
April	50.85	70.26	71.33	81.34	October	70.45	61.00	71.64	81.10
May	54.40	67.16	72.65	81.60	November	70.45	61.34	72.43	86.04
June	54.75	66.80	71.91	82.21	December	70.75	59.95	70.84	90.39

[1] Eng. and Min. Jour.-Press.

IMPORTS AND EXPORTS

In 1925, 20,855 flasks of mercury, valued at $1,200,878, were imported for consumption in the United States, the highest imports ever recorded and 7,685 flasks more than in 1924. The imports in 1924, however, were much smaller than in 1923, when they amounted to 18,073 flasks, the largest number recorded prior to 1925.

The largest quantity of mercury exported to the United States by any one country in 1925 came from Italy, with Spain second and Mexico third. Mexico, however, furnished only about 10 per cent as much mercury as Spain. The exports of mercury from the United States have been relatively negligible for a number of years.

Mercury imported for consumption in the United States, 1919–1925

Year	Pounds	Metric tons	Flasks	Value
1919	797,613	361.79	10,635	$791,226
1920	1,062,647	482.01	14,169	971,510
1921	795,078	360.64	10,601	457,993
1922	1,269,004	575.61	16,920	757,842
1923	1,355,499	614.84	18,073	816,043
1924	987,719	448.02	13,170	566,820
1925	1,564,112	709.47	20,855	1,200,878

Mercury imported into the United States, 1923–1925, by countries

[General imports]

Country	1923		1924		1925	
	Pounds	Value	Pounds	Value	Pounds	Value
Argentina	2,700	$1,301				
Belgium			3,000	$1,937	11,250	$9,700
Canada					22,500	18,828
Chile	805	650				
Cuba			2,475	1,090		
Germany	6,273	4,525	10,605	5,852	6	7
Honduras	175	88				
Hongkong			5	4		
Italy	472,421	273,401	583,380	336,025	843,358	640,150
Mexico	85,868	46,749	87,096	43,465	74,377	50,607
Spain	800,529	448,963	80,717	45,294	731,569	579,344
United Kingdom	199,780	125,354	138,400	87,203	25,500	22,950
	1,568,551	901,031	905,678	520,870	1,708,560	1,321,586

Mercury exported from the United States, 1919–1925

Year	Pounds	Metric tons	Flasks	Value
1919	683,004	309.80	9,107	$817,328
1920	116,493	52.84	1,553	129,993
1921	29,501	13.38	393	18,869
1922	21,834	9.90	291	15,910
1923	23,827	10.81	318	25,195
1924	15,581	7.07	208	14,333
1925	15,289	6.93	204	15,930

Mercury exported from the United States, 1923–1925, by countries

Country	1923		1924		1925	
	Pounds	Value	Pounds	Value	Pounds	Value
North America:						
British Honduras	4	$6	50	$50		
Canada	13,380	15,118	2,421	2,000	4,388	$4,155
Costa Rica	305	289	570	531	512	591
Guatemala			450	360	107	108
Honduras	121	148	87	96	228	305
Mexico	616	653	1,431	1,788	677	704
Nicaragua	376	434	675	660	965	1,119
Panama	421	344	2	2	249	216
Salvador	375	388	600	622	170	208
West Indies—						
British	12	17				
Cuba	476	451	630	717	828	1,088
Dominican Republic	110	110	1,126	787		
Dutch			25	29		
Haiti	175	192	155	159		
Virgin Islands of the United States	15	15	30	13		
South America:						
Argentina	75	91				
Brazil	1,500	1,378	97	104	100	165
Chile	175	209			341	492
Colombia	2,031	1,811	3,449	2,965	2,951	3,147
Ecuador	10	13	60	70	532	537
Guiana, British	225	240				
Peru	812	814	690	799	869	1,050
Venezuela	786	691	397	374	550	449
Europe:						
Sweden	55	49			99	70
United Kingdom	20	29	50	44	48	96
Asia:						
China			30	28		
Chosen	900	852				
East Indies—						
British India					60	76
Dutch	75	75				
Japan	77	108			80	143
Philippine Islands	620	560	1,676	1,625	435	518
Oceania:						
Australia					1,100	693
New Zealand	80	110	880	510		
	23,827	25,195	15,581	14,333	15,289	15,930

DOMESTIC DUTIES

United States duties on mercury are shown in the table that follows:

Rates of duty on imported mercury

Act of—	Paragraph	Tariff classification or description	Rates of duty
1883	211	Mercury	10 per cent ad valorem.
1890	207	do	10 cents per pound.
1894	170½	do	7 cents per pound.
1897	189	do	Do.
1909	189	do	Do.
1913	159	do	10 per cent ad valorem.
1922	386	do	25 cents per pound.

The present tariff of 25 cents a pound on all mercury imported became effective September 22, 1922. In 1923 the production was 7,937 flasks, in 1924 it was 10,085 flasks, and in 1925 the production was 9,174 flasks, or 911 flasks less than in 1924. In 1923 the average New York price per flask was $66.50. The monthly fluctuation for the year varied from $60 to $72.73. In 1924 the average price was $69.76, and the monthly price range was $59.50 to $76.96. In 1925 the average price was $83.13. The monthly fluctuation for the year ranged from $79.39 to $90.

From what has been stated it can be seen that prices have been ascending and production has decreased. The variations in price in 1925 were not large. The demands of the producers before the Tariff Commission June 26, 1918,[3] on the basis of war value as to price and stability of market, have been met in 1925 in that the producers' assumption of $100 a flask was based on war prices. The general price index figure (1913 base = 100) for 1918 was about 200; and in 1925, about 160, which makes the value of a flask of mercury on the basis of 1913 dollars $62 in 1918 and $52 in 1925.

FOREIGN DUTIES

Mercury is admitted free of duty in Great Britain, France, Sweden, Denmark, Austria, and Japan. Canadian imports are dutiable at 7.5 per cent, but imports from other British territory have a preferential duty of 5 per cent. A duty of ⅞-cent per pound was levied on all mercury imported into Italy. In Spain mercury comes under the blanket clause for metals which provides a ⅞-cent duty per pound. China levies an export duty of approximately 1.75 cents per pound.

CONSUMPTION AND SUPPLY

The average annual consumption of mercury in recent years in the United States has ranged between 18,000 and 25,000 flasks. The distribution of the amounts consumed according to types of uses is not known with any degree of accuracy except for the war years 1917 and 1918. The relative proportions variously used in those years do not represent present or normal distribution. The only available approximation of the total annual consumption is represented by a combination of the figures on production, imports, and exports, which determine the annual new supply. The figures so obtained depart from the true measure of consumption by the amount of change in stocks from year to year plus the amount of used mercury recovered for reuse, and these amounts are not determinable. With respect to stocks there are on record only the quantities in bonded warehouses, which were on December 31, 1924, 116 flasks of mercury and on December 31, 1925, 1,181 flasks.

[3] United States Tariff Commission, Information Series 21, 1920, p. 269.

Supply of mercury in the United States, 1907–1925

Year	Production		Imports for consumption		Exports		Apparent supply	
	Flasks	Value	Flasks	Value	Flasks	Value	Flasks	Value
1907	21,554	$853,538	221	$6,719	5,132	$192,094	16,643	$668,163
1908	19,752	872,446	202	8,216	2,996	124,960	16,958	755,702
1909	21,075	957,859	213	8,203	6,802	266,243	14,486	699,819
1910	20,601	958,153	9	381	1,923	91,077	18,687	867,457
1911	21,256	977,989	6,292	251,386	291	13,995	27,257	1,215,380
1912	25,064	1,053,941	1,103	39,920	310	13,360	25,857	1,080,501
1913	20,213	813,171	2,289	75,361	1,140	43,574	21,362	844,958
1914	16,548	811,680	8,198	271,984	1,446	70,753	23,300	1,012,911
1915	21,033	1,804,631	5,625	282,752	3,372	225,509	23,286	1,861,874
1916	29,932	3,768,139	5,659	515,919	8,880	670,475	26,711	3,613,583
1917	36,159	3,803,266	5,207	448,032	10,778	998,470	30,588	3,257,828
1918	32,883	3,863,752	6,719	533,622	3,098	338,620	36,504	4,058,754
1919	21,415	1,933,560	10,635	791,226	9,107	817,328	22,943	1,907,458
1920	13,392	1,066,807	14,169	971,510	1,553	129,993	26,008	1,908,324
1921	6,339	300,595	10,601	457,993	393	18,869	16,547	739,719
1922	6,375	368,348	16,920	757,842	291	15,910	23,004	1,110,280
1923	7,937	521,302	18,073	816,043	318	25,195	25,692	1,312,150
1924	[1] 10,085	[1] 692,739	13,170	566,820	208	14,333	23,047	1,245,226
1925	9,174	762,616	20,855	1,200,878	204	15,930	29,825	1,947,564

[1] Revised figures.

WORLD'S PRODUCTION

World's production of mercury, 1921–1925, by countries

[Compiled by L. M. Jones, of the Bureau of Mines]

[1 metric ton = 29.395 flasks]

Country [1]	1921		1922		1923		1924		1925	
	Flasks	Metric tons	Flasks	Metric tons	Flasks	Metric tons	Flasks	Metric tons	Flasks	Metric tons
Algeria							79	2.7	58	2.0
China	2,881	98.0	503	17.1	47	1.6	85	2.9	97	3.3
Czechoslovakia	1,678	57.1	185	6.3	1,514	51.5	2,287	77.8	[2]	[2]
Italy	31,482	1,071.0	45,298	1,541.0	48,666	1,655.6	48,237	1,641.0	53,898	1,833.6
Japan	173	5.9	35	1.2	[3]	[3]			[2]	[2]
Mexico	1,352	46.0	1,229	41.8	1,316	44.8	1,078	36.7	1,138	38.7
New Zealand	21	.7	21	.7						
Rumania					[4]	[4]	8	.3	[2]	[2]
Russia	138	4.7	647	22.0	1,499	51.0	[5] 1,945	[5] 66.2	[5] 291	[5] 9.9
Spain	18,678	635.4	38,748	1,318.2	33,646	1,144.6	26,417	898.7	37,546	1,277.3
United States	6,339	215.6	6,375	216.9	7,937	270.0	[6] 10,085	343.1	9,174	312.1
	62,742	2,134.4	93,041	3,165.2	94,625	3,219.1	90,221	3,069.4	[7] 104,000	[7] 3,500

[1] In addition to the countries shown in the table Bolivia exported in 1921, 72 kilograms (2 flasks). Information furnished on May 21, 1923, by the United States High Commissioner of Turkey places Turkey's average annual production at approximately 67 tons (1,969 flasks). These figures are not included in the above totals.

[2] Data not available.

[3] 4 kilograms reported.

[4] Production of 200 tons of ore reported; metallic content not stated.

[5] Figures represent output for year ended Sept. 30.

[6] Revised figures.

[7] Estimate.

GEOLOGICAL DISTRIBUTION

An outstanding feature of the occurrence of mercury deposits is that they may be found in rocks of any age. Ore has been found in sandstones, shale, limestone, basalt, rhyolite, granite, andesite, and serpentine. In Mineral Resources of the United States under the chapters on quicksilver in 1917 and 1918, the geological distribution and occurrence of mercury deposits are discussed fully. Since 1918 no new deposits of any consequence have been found.

METALLURGY

The metallurgy of mercury has been thoroughly covered by Duschak and Schuette [4] in a Bureau of Mines bulletin.

USES OF MERCURY

Mercury is the only common metal that is liquid at ordinary temperatures, and this characteristic enables it to supply needs for which there are no known substitutes.[5] It alloys readily with certain other metals forming amalgams, many of which are plastic. The ease with which gold and silver amalgamate has been utilized for the recovery of those metals, but this use has been largely supplanted by the cyanide and flotation processes. The most important use of mercury is as a fulminate in blasting caps and other detonators. The metal, its mercurous and mercuric chlorides, and other compounds are used in medical preparations. Antifouling paints for ship bottoms are made with oxide of mercury which the salt in the sea water converts into mercuric chloride, thus forming an active poison. Mercury is also used in heating, electrical controlling apparatus, vapor lamps, cosmetics, vermilion, boiler compounds, dental amalgam, in thermometers, and by hatters and furriers in preparing raw materials.

SUBSTITUTES

Silver may be used as a fulminate,[6] and several other detonators in which lead forms the principal compound, such as lead azide and lead trinitro-resorcinate, are on the market. Diazobenzene nitrate and others have also been used. The amount of mercury used, for which there is no substitute, is extremely small.

POTENTIAL USES

A possible important use of mercury is for the Emmet boiler, manufactured by the General Electric Co. Mercury is generated in a fuel-heated boiler to drive a turbine. The exhaust from the turbine heats a second boiler that serves as both a condenser for the mercury and a source of steam for a steam turbine. The mercury is used in a closed circuit.[7]

DOMESTIC RESERVES

The character of mercury deposits and the rapid changes of price in the past have militated against the development of ore reserves and systematic mining. From the standpoint of the miner, the measure of the reserves of any mineral must be based on a price at which mining is profitable. For the reasons enumerated, the domestic reserves of mercury have never been estimated. A fair inference from the history of production seems to be that the reserves at the

[4] Duschak, L. H., and Schuette, C. N., The Metallurgy of Quicksilver: Bull. 222, Bureau of Mines. 1925, 173 pp.
[5] Caesium is liquid at temperatures above 77° F., gallium at temperatures above 86° F.
[6] Munroe, C. E., Bureau of Mines, Washington, D. C.
[7] Colton, J. W., "Mercury vapor turbine": Aera, vol. 12, January, 1924, pp. 916–920. New invention put in practical service greatly increases fuel efficiency and ultimately may lead to a revolution in boiler-house practice in electric generating stations.

present price are being rapidly depleted, for production is decreasing and prices are rising. High-grade mines of mercury in the United States are conspicuous by their absence. The large low-grade deposits, such as the New Almaden and New Idria, the former having produced almost continuously since 1850, are reaching economic exhaustion. In the past few years the handling of extremely low-grade ores has been made possible by the use of crude petroleum instead of cordwood as fuel. This innovation has prolonged the life of several California properties. Unless new methods which will enable ore of lower grade to be worked profitably are devised, the domestic demand can be satisfied economically only from foreign sources.

Data covering 8,627 flasks of the total production of 9,174 flasks for the United States for 1925 show the production per man in that year to have been 28.10 flasks. The production per man-day was 0.086 flask. Of the 547 flasks produced for which there are no data regarding men or days worked, 397 flasks were obtained from old dumps, etc.

MINING INDUSTRY BY STATES

ALASKA

Production has been negligible but it seems probable that with a sufficient demand a small output could be made. The deposits are in the central Kuskokwim region. No metallic mercury was shipped in 1925.

ARIZONA

In 1925 the Sun Flower mine in the Mazatzal Mountains produced 30 flasks, the total for the State. Considerable prospecting is being done in that locality. The ore reserves have never been estimated. The mineralized area is very large and gives promise of future production. Schrader [8] has examined and described the Phoenix Mountain area. The Rico group [9] is a prospect of some promise; a sample of the stock pile showed 0.72 per cent mercury. Schrader says "it is quite possible that with deeper and wider development several thousand tons of ore may be found."

CALIFORNIA

In 1925 the production of mercury in California was 7,614 flasks, or 83 per cent of the total output of the United States. Seven mines contributed to this production. The total quantity of crude ore treated was 58,723 short tons; the average tenor of the ore was 0.49 per cent. The number of men employed in producing 7,612 flasks of this total was 187, showing a productivity of 40.71 flasks per man per

[8] Schrader, F. C., "Quicksilver deposits of the Phoenix Mountains, Ariz."; chapter in Contributions to Economic Geology: U. S. Geol Survey Bull. 690, pt. 2, 1919, p. 690.

[9] From an unpublished report by E. D. Gardner, mining engineer, Bureau of Mines, and Carl Lawson, geologist, Arizona Bureau of Mines, Sept. 15, 1924.

annum. The following table gives the annual mercury production of California from 1850 to 1925:

Mercury produced in California, 1850–1925

[Prior to June, 1904, flasks contained 76.5 pounds; thereafter 75 pounds]

Year	Flasks	Price per flask (San Francisco)	Value	Year	Flasks	Price per flask (San Francisco)	Value
1850	7,723	$99.45	$768,052	1889	26,464	$45.00	$1,190,880
1851	27,779	66.93	1,859,248	1890	22,926	52.50	1,203,615
1852	20,000	58.33	1,166,600	1891	22,904	45.25	1,036,406
1853	22,284	55.45	1,235,648	1892	27,993	40.71	1,139,595
1854	30,004	55.45	1,663,722	1893	30,164	36.75	1,108,527
1855	33,000	53.55	1,767,150	1894	30,416	30.70	933,771
1856	30,000	51.65	1,549,500	1895	36,067	37.04	1,335,922
1857	28,204	48.73	1,374,381	1896	30,765	34.96	1,075,544
1858	31,000	47.83	1,482,730	1897	26,691	37.28	995,040
1859	13,000	63.13	820,690	1898	31,092	38.23	1,188,647
1860	10,000	53.55	535,500	1899	29,454	47.70	1,404,956
1861	35,000	42.05	1,471,750	1900	26,317	44.94	1,182,686
1862	42,000	36.35	1,526,700	1901	26,720	48.46	1,294,851
1863	40,531	42.08	1,705,544	1902	28,972	43.20	1,251,590
1864	47,489	45.90	2,179,745	1903	30,526	45.29	1,382,523
1865	53,000	45.90	2,432,700	1904	29,217	43.50	1,270,940
1866	46,550	53.13	2,473,202	1905	24,635	36.22	892,280
1867	47,000	45.90	2,157,300	1906	20,310	39.50	802,245
1868	47,728	45.90	2,190,715	1907	17,431	39.60	690,268
1869	33,811	45.90	1,551,925	1908	16,984	44.17	750,183
1870	30,077	57.38	1,725,818	1909	16,078	45.45	730,745
1871	31,686	63.10	1,999,387	1910	17,211	46.51	800,484
1872	31,621	65.93	2,084,773	1911	18,860	46.01	867,749
1873	27,642	80.33	2,220,482	1912	20,524	42.05	863,034
1874	27,756	105.18	2,919,376	1913	15,591	40.23	627,228
1875	50,250	84.15	4,228,538	1914	11,303	49.05	554,414
1876	72,716	44.00	3,199,504	1915	14,283	85.80	1,225,481
1877	79,395	37.30	2,961,434	1916	21,045	125.89	2,649,355
1878	63,880	32.90	2,101,652	1917	23,938	105.32	2,521,151
1879	73,684	29.85	2,199,467	1918	22,664	117.50	2,663,020
1880	59,926	31.00	1,857,706	1919	15,205	90.29	1,372,859
1881	60,851	29.83	1,815,185	1920	9,849	79.66	784,571
1882	52,682	28.23	1,487,213	1921	3,055	47.42	144,868
1883	46,725	28.75	1,343,344	1922	3,405	57.78	196,741
1884	31,913	30.50	973,347	1923	5,447	65.68	357,759
1885	32,073	30.75	986,245	1924	7,966	68.69	547,185
1886	29,981	35.50	1,064,325	1925	7,614	82.67	[1] 632,936
1887	33,760	42.375	1,430,580				
1888	33,250	42.50	1,370,625		2,286,057	----------	109,551,852

[1] For 1925 the value is calculated on the New York average price, $83.128 per flask.

Colusa County.—The total production of Colusa County has been approximately 3,000 flasks, of which the Manzanita mine, one-half mile west of Wilbur Springs, has contributed 2,000 flasks. There was no production in 1925 and the mines have been idle for many years. The inference must be drawn that at present prices there are no reserves.

Eldorado County.—No record of the production is available. There are two known occurrences, one owned by the Alpine Quicksilver Mining Co., situated in the mining district of Georgetown southwest of Collins, and the other by the Bernard Mining Co., 8 miles south of Diamond Springs. The latter company has made a small production but has been idle for years. There is no estimate of reserves.

Fresno County.—According to the records available the total production has been 903 flasks, all of which has come from the Mercy mine, 18 miles southwest of Dos Palos (in Merced County). Operations have been desultory during the last few years, and there was no production in 1925. Reserves are not known.

Kern County.—One mine, the Cuddeback, near Keene, has made the total production of Kern County—539 flasks. This mine has been idle since 1920. At present prices no reserves are known.

Kings County.—The total production of Kings County—1,068 flasks—has been from two mines—the Dawson, 15 miles east of Parkfield, and the Kings mine, 14 miles east of Parkfield (Monterey County). A small production was made in 1925. There is no known estimate of reserves.

Lake County.—The 11 known deposits have produced 267,779 flasks. The largest single producer, the Great Western, situated 4 miles southwest of Middletown, has contributed 101,275 flasks of the total. This property has been abandoned and dismantled. The second largest producer, the Sulphur Bank property, about 10 miles north of Lower Lake, has contributed 95,000 flasks. In 1918 the underground workings of this property were full of water. There has been no production from the mine since 1919 and only a negligible recovery from dumps.

Monterey County.—Monterey County has produced, through 1925, about 1,929 flasks from its only mercury mine, the Patriquin, situated 5 miles north of Parkfield. No reserves are known.

Napa County.—There are eight mercury mines and prospects in Napa County. There was no production in 1925. The total production has been 335,260 flasks, of which the Knoxville mine, 20 miles northwest of Monticello, has contributed 121,055 flasks. Except for a small production in 1922, the mine has been idle since 1900. The Oak Hill mine, 9 miles southeast of Middletown (Lake County), has contributed 132,518 flasks of the total production. After having been abandoned for many years the mine was partly reopened in 1918, and since then has made an intermittent production. There are no known reserves.

San Benito County.—There are 12 mercury mines and prospects in San Benito County. The total production has been 340,468 flasks, of which the New Idria mine, at Idria, has contributed 338,881 flasks. This is the only producing property at present. The majority of the deposits have not been worked for many years. No record of reserves is available.

San Luis Obispo County.—Ten deposits have been worked in San Luis Obispo County. The total production has been 44,351 flasks, of which the Oceanic mine, situated 5 miles northeast of Cambria, has contributed 27,168 flasks. This property has been idle since 1920. No estimate of the reserves of this county is known. With the exception of the Oceanic and three small mines the mines and prospects have been abandoned for many years. In 1925 the Rinconada mine, near Santa Marguerita, produced a small quantity.

Santa Barbara County.—Two deposits, the Acachuma, 12 miles northeast from Los Olivos, and the Los Prietos, 8 miles north of Santa Barbara, have been worked. The total production has been 1,136 flasks, of which approximately 1,000 flasks were produced by the Los Prietos mine. The two properties have been idle since 1921. No estimate of reserves is known.

Santa Clara County.—There are six deposits and prospects in Santa Clara County. The total production has been 1,148,894 flasks, of which the New Almaden mine, 12 miles south of San Jose, has con-

tributed 1,058,632 flasks. This is the oldest mine in California and has been one of the most productive in the world. It has been mined to a depth of 2,245 feet, but the lower levels are now under water. No estimate of reserves is available for this county. The new Guadalupe, 5 miles southeast of Los Gatos, was reopened in 1918, but has since been dismantled. This mine has had a total production of 88,762 flasks.

Siskiyou County.—No production is on record. An attempt was made some years ago to develop a property in the Empire Creek mining district and a small production is said to have been made. There is no known estimate of reserves.

Solano County.—There are three known properties, two of which, however, have long been unproductive. The total recorded production of 17,288 flasks has all been made by the St. John's mine, 6 miles southeast of Vallejo. No estimate of any reserves is available.

Sonoma County.—There are six known properties, from which a total production of 60,815 flasks has been made. There is no available estimate of any reserves. The Great Eastern, 3 miles northeast of Guerneville, has contributed 43,545 flasks. At present this property is idle, and the lower level is under water.

Stanislaus County.—The total production of Stanislaus County has been about 200 flasks, all from the mine of the Phoenix Mining Co. This mine is approximately 39 miles south of Livermore, but has been idle many years. No estimate of reserves is available.

Trinity County.—There are two deposits in Trinity County. The total production of the Altoona mine, 15 miles northeast of Carrville, has been 29,406 flasks. There has been no record of any production from the other mine. Except for a small production from dumps in 1918 and a small production in 1919, 1920, and 1921, the Altoona mine has been idle since 1900.

Yolo County.—The total production of Yolo County has been 5,821 flasks, of which the long-idle Reed property, 3 miles southwest of Rumsey, has contributed 5,700 flasks. No estimate of the reserves of the county is known.

IDAHO

The production of Idaho has been confined to two mines with total production through 1925 of 41 flasks. Several prospects of promise are being developed in Custer and Valley Counties.

NEVADA

Elko County.—The Ivanhoe mine has produced 20 flasks—the total output of Elko County. The mine has been idle many years.

Esmeralda County.—There are four properties of record in Esmeralda County. They are in the Cinnabar Mountain mining district, but have made no production.

Eureka County.—In Eureka County are two properties, situated in the mining district of Beowawe. No production of record has been made.

Lander County.—The one property of record in Lander County is in the mining district of New Past Range. It has made a production of less than 100 flasks.

Mineral County.—There are five properties of record in Mineral County. The total production has been 2,028 flasks, of which 860 flasks came from the Bugg and Drew Mining Co., 14 miles east of Mina.

Nye County.—The total production of Nye County has been 10,890 flasks. It has come from two mines, the larger of which has produced 6,909 flasks. There has been no production made from underground methods. The mines mentioned are in the Bear Mountain mining district, near Ione.

Pershing County.—There are five known properties in Pershing County. The total production has been 2,392 flasks, of which the Gold Bank Mining Co., 30 miles south of Winnemucca, has produced 1,461 flasks. There was no production in 1925, and all properties have been idle since 1918.

OREGON

Douglas County.—The one property of record in Douglas County has been idle many years, and there is no record of any production.

Jackson County.—Approximately 528 flasks have been produced from two properties of record in Jackson County.

Lane County.—The total recorded production in Lane County, 2,313 flasks, has come from the Black Butte mine, which is the only property of record. There has been no production since 1919.

TEXAS

Brewster County.—In the Terlingua district a mineralized area of considerable extent gives promise of future production. This area extends into Mexico, where several claims have been located. Development has been retarded by inaccessibility; the district is more than 100 miles from a railway. Water has been encountered in the lower levels of the developed properties. Fuel is cheap, as low-grade coal is found in abundance near-by. There are seven mercury properties in the county. The total production has been approximately 98,512 flasks.

Presidio County.—One mine has produced 4,500 flasks, the total production of the county.

FOREIGN SOURCES

SPAIN

The largest and richest deposit of mercury now known in the world is at Almaden, in central Spain, near the extreme western point of the Province of Ciudad Real. This deposit has been mined almost continuously since Roman times and has been owned and worked by the Spanish Government since 1645. The ore bodies are large, some of them attaining 36 feet in width and as much as 600 feet in length. The mine has been developed to a depth of more than 2,000 feet and the available reserve has been estimated as at least 40,000 metric tons of metal.[10]

[10] Sterner-Rainer, R., "Der derzeitige Stand des Quecksilberhüttenwesens in Europa": Oest. Ztschr. Berg-Hüt., Bd. 62, 1914, p. 531.

In the lower workings the ore shoots are longer, the tenor of the ore is higher, and the vein is wider.[11] The average content of all ore mined is said to be about 8 per cent. According to Spanish Government reports, however, the mercury extracted was 6.06 per cent in 1922. The production in the past two years has amounted to about 26,000 flasks per annum. In 1924 the productivity per man was 18.53 flasks. The pre-war average cost of producing a flask has been estimated at $15; since the war the working costs have been estimated at $45 per flask.[12] Deposits of minor importance are found in the Provinces of Asturias, Badajos, Granada, Santander, and Valencia.

Mercury produced in Spain in 1922 and 1924

Province	Number of mines	Workmen		Ore mined		Metal produced		
		At mines	At plants	Metric tons	Tenor [1]	Flasks	Value [2]	Flasks per man
1922								
Ciudad Real	1	1,095	412	13,512	6.06	38,630	$763,406	25.64
Granada	5	63	18	862	.51	118	2,472	1.44
	6	1,158	430	14,374	----	38,748	765,878	----
1924								
Ciudad Real	1	1,023	395	14,522	7.00	26,270	633,066	18.53
Granada	3	21	9	670	.70	147	3,747	4.90
	4	1,044	404	15,192	----	26,417	636,813	----

[1] Discrepancy as to tenor of ore during these two years is unaccounted for.
[2] Exchange rate of peseta: 1922, 15.48 cents; 1924, 13.34 cents.

ITALY

The principal deposits of Italy are those at Idria, which formerly belonged to Austria, and those of the Monte Amiata district. As in Spain, the mercury mines are owned by the Government. In 1918 the Idria mines were being worked by the Austrian technical staff under the supervision of an Italian engineer. On November 12, 1920, the mines passed definitely into the possession of the Italian Government. The ore-bearing belt has been exploited for a length of 4,600 feet, but the ore bodies found apparently do not extend downward more than 1,000 feet. The average grade is low in comparison with the Almaden ore, being between 0.62 per cent and 1 per cent. As these mines have been operated since the time of the ancient Etruscans, many of them have been worked out, and the area as a whole is rapidly approaching exhaustion. In 1924 the production per man per annum was 13.98 flasks as compared with 10.53 flasks in 1921.

The mines of the Monte Amiata district, mostly in Tuscany, Province of Siena, but partly also in the Province of Grosseto, are the greatest producing mercury mines in Italy. At present the area has six important producing mines and a great number of smaller

[11] Halse, Edward, Mercury Ores: Imperial Institute Monograph, London, 1925, p. 50.
[12] Burcham, W. D., "Quicksilver": Mineral Industry, vol. 28, 1919, p. 618.

mines, some of which are idle. About 65 per cent of the total output is attributed to the Abbadia-San Salvador mine. In 1924 the Province of Siena produced 28,895 flasks, with a value of 29,490,000 lire. In 1924 the tenor of the ore mined was 1.03 per cent, and the production per man per annum was 22.04 flasks.

The Province of Grosseto has the smallest production of the three Provinces mentioned. In 1924 the tenor of the ore was 0.54 per cent; the total production was 5,673 flasks, and the output per man was 10.74 flasks.

Mercury produced in Italy in 1921 and 1924

Province	Number of mines	Workmen		Tenor of ore	Metal produced		
		At mines	At plants		Flasks	Value (lire) [1]	Flasks per man
1921							
Friuli (Trieste)	1	1,005	[2] 168	0.62	12,346	9,240,000	10.53
Grosseto	2	258	[2] 127	.53	2,734	2,046,000	7.10
Siena	3	1,000	[2] 434	.87	16,402	12,276,000	11.44
	6	2,263	[2] 729		31,482	23,562,000	
1924 [3]							
Friuli (Trieste)	1	838	140	.68	13,669	13,020,000	13.98
Grosseto	4	354	174	.54	5,673	5,790,000	10.74
Siena	3	914	397	1.03	28,895	29,490,000	22.04
	8	2,106	711		48,237	48,300,000	

[1] Exchange rate of lira: 1921, 4.29 cents; 1924, 4.358 cents.
[2] Estimate by Bureau of Mines on 1924 ratio of mine workmen to plant workmen.
[3] Exclusive of a small operation in Roma where mercury ore was mined.

OTHER COUNTRIES

The combined output from all producing mines other than those in the countries already named is but a small fraction of the world's consumption. The development of other sources has not been retarded by high costs of production, but deposits large enough to warrant exploitation have not been discovered. Of the minor sources, China, Czechoslovakia, Mexico, and Peru are the most important. All other sources are negligible and contribute only a fraction of a per cent to the world's consumption.[13]

POLITICAL AND COMMERCIAL CONTROL

As already stated, the Almaden mine of Spain has been owned and operated by the Spanish Government since 1645. The policy of the Government has been to award the output of mercury to the highest bidder for a 10-year period. For a number of successive periods Rothschilds & Co., of London, were awarded the contract.[14] During the period represented by June 1, 1912, to June 1, 1923, the Roth-

[13] For more information on the world's sources see the following chapters on "Quicksilver" in Mineral Resources: 1916, by H. D. McCaskey, pp. 757–773; 1917, by F. L. Ransome, pp. 367–455 (with bibliography by Isabel P. Evans on pp. 425–455); 1918, by F. L. Ransome, pp. 143–182. See also Halse, Edward, Mercury Ores: Imperial Institute Monograph, London, 1925; Ransome, F. L., "Mercury," chapter in Political and Commercial Geology, by J. E. Spurr, New York, pp. 337–348.
[14] Special Report No. 2, Consular Service, by W. M. Strachan. Apr. 10, 1919, Bureau of Mines Foreign Files. Hurst, Consul General, Barcelona, Spain, 1919. Bureau of Mines Foreign Files.

schilds bound themselves to sell the mine output, which they took f. o. b. at the reduction plants at Almaden at a basic price of £7 per flask. The contractor was to receive a commission of 1.25 per cent of the amount of the sale, 6s. per each flask shipped from Spain to London, and 10 per cent of the amount by which the sale exceeded £8 2s. per flask.

While this contract was in force, the Spanish Government reserved 500 flasks annually for national requirements. As the marketing of the product was thus controlled in London, the erroneous idea prevailed that Rothschilds & Co. controlled the world's price of mercury.

Prior to 1911 it was obviously beyond the power of Rothschilds & Co. to set a price, because the United States was an exporter of mercury, and the exportable surplus was the marginal production which regulated the world's price. After the contract with the Rothschilds terminated in the summer of 1923 the Spanish Government for a period of three years sold direct the output of mercury. This method of marketing was not successful, and in the early part of 1924 a contract was given to Pickering & Co. (presumably agents of the Rothschilds) for the sale of all mercury for a period of one year. At the expiration of this contract the Government awarded the sales agency to a newly formed company, the Sociedad General de Mercurio de Madrid, for the years 1926 and 1927, with the option of an additional year. The company was financed by the Banco de Credito of Madrid.

At Almaden, probably because of the long time that this property has been under Government control, labor has imposed many regulations that have caused inefficiency and decreased the output. As an example, the men engaged in the actual breaking of the ore work only three days in a week in order to avoid mercurial poisoning. The methods of extraction are crude. Some of the original Bustamente furnaces built at Almaden in 1646 are still in use. As already stated, the mine run of ore is reported to contain 8 per cent mercury, and the extraction from ore mined, based upon flasks produced, is 6 per cent. The indicated loss alone—namely, 25 per cent of the original content, equivalent to more than half a flask per ton of ore—is four times as great as the average tenor of the ore treated in the United States and possibly three times that of Italy.

Since the World War the mercury mines of Italy have been controlled and operated by the Italian Government. The industry is on a thoroughly up-to-date basis, and the efficiency is as great as that developed in any other mercury-producing country.

To a consumer the present situation would seem to indicate that in order to supply the demand for mercury the deposits of Spain which contain the largest known reserves will have to be drawn upon heavily. Of the two Italian fields, the Idria district is rapidly reaching exhaustion; the Monte Amiata district may be able to maintain its present rate of production for 20 years. The United States, once the largest producer of mercury, is now a minor contributor to the world's supply. As the world's consumption of mercury for the last 20 years (exclusive of the war period) has been decreasing while the price has been rising, the present increased demand for storage batteries, meters, radio equipment, and general electrical uses, as well as the potential demand that probably will be created by the

introduction of the Emmet vapor boiler, indicates that in order to meet this increase, or even to maintain the present rate of consumption, more mercury will have to come from Spain. Heretofore, due to the conditions already mentioned, there seems to have been no collusion among producing countries to establish or maintain the price of mercury, although since 1919 Spain and Italy have had the power to control it. The United States from time to time has attempted to increase production by changing the import duty. At present (July, 1926) mercury is selling for $90 a flask. If the world's demand is to be met without a material increase in output by Spain, the present price will have to be raised in order to start production from Peru, Mexico, China, and other countries. Higher prices seem inevitable.

The political as well as the commercial control of those sources of mercury upon which the world must depend chiefly for its supply rests at present with the Spanish and Italian Governments.

PLATINUM AND ALLIED METALS

By James M. Hill[1]

CRUDE PLATINUM

Mine returns for 1925 indicate a production of 12 troy ounces of crude platinum in Alaska, 312 ounces in California, and 19 ounces in Oregon, a total of 343 ounces for the United States. In 1924, Alaska produced 28 ounces, California 285 ounces, Oregon 20 ounces, and Utah 2 ounces.

Platinum refiners report purchases of domestic platinum in 1925 as follows: Alaska 24 ounces; California 160 ounces; Oregon 60 ounces; Colorado and Utah 7 ounces—a total of 251 ounces, or 59 ounces more than refiners purchased in 1924. Refiners also report purchases of 47,297 ounces of foreign crude platinum in 1925—4,852 ounces from Australia, 2 ounces from Canada, 37,962 ounces from Colombia, 4,473 ounces from Russia, and 8 ounces from the Dutch East Indies. The total is 17,182 ounces less than the purchases reported in 1924. According to the Bureau of Foreign and Domestic Commerce the imports of platinum from Colombia during 1925 were 33,595 ounces, and the total imports of unmanufactured platinum 106,478 ounces, an increase of 11 per cent, as compared with imports of crude in 1924.

REFINED PLATINUM METALS

NEW METALS

Reports of refiners of crude platinum, gold bullion, and copper indicate that 49,643 ounces of platinum metals were recovered in the United States from these sources in 1925, a decrease of 16,364 ounces, or 25 per cent, as compared with recoveries in 1924. It is estimated that of the total quantity in 1925 11,209 ounces was derived from domestic sources.

New platinum metals recovered by refiners in the United States, 1916–1925, in troy ounces

Year	Platinum	Palladium	Iridium	Osmiridium	Others	Total
1916	24,518	2,885	370	315	----------	28,088
1917	33,009	4,779	210	833	----------	38,831
1918	54,399	4,024	465	539	326	59,753
1919	40,220	3,807	401	402	279	45,109
1920	36,015	4,309	418	409	393	41,544
1921	51,791	2,686	286	581	1,026	56,370
1922	54,142	1,943	210	1,301	122	57,718
1923	46,780	1,934	280	787	16	49,797
1924	57,827	6,065	680	1,261	174	66,007
1925	41,300	7,358	283	648	54	49,643

[1] Helen M. Gaylord, of the Bureau of Mines, assisted in the preparation of this report. The figures on imports and exports were compiled from records of the Bureau of Foreign and Domestic Commerce by J. A. Dorsey, of the Bureau of Mines.

New platinum metals recovered by refiners in the United States, 1924–25, by sources, in troy ounces

Year	Platinum	Palladium	Iridium	Osmiridium	Others	Total
1924						
Domestic:						
Crude platinum	66		27	16	4	113
Ore		775				775
Gold and copper refining	3,457	2,893	26	16		6,392
	3,523	3,668	53	32	4	7,280
Foreign:						
Crude platinum	52,766	369	627	1,229	70	55,061
Ore	1,538	2,028			100	3,666
	54,304	2,397	627	1,229	170	58,727
Total recovery	57,827	6,065	680	1,261	174	66,007
1925						
Domestic:						
Crude platinum	136		36	39	3	214
Ore		2,842				2,842
Gold and copper refining	4,189	3,952		12		8,153
	4,325	6,794	36	51	3	11,209
Foreign:						
Crude	36,740	259	237	597	51	37,884
Gold and copper refining	235	305	10			550
	36,975	564	247	597	51	38,434
Total recovery	41,300	7,358	283	648	54	49,643

SECONDARY METALS

Secondary platinum metals are those recovered from the treatment of scrap metal, sweeps, and other waste products of manufacture that contain platinum. Although the figures in the following table undoubtedly contain some duplication, it is believed that they are worth publishing, for the secondary metals constitute a considerable proportion—19 per cent in 1925—of the total platinum metals available for consumption in the United States. The fact that the recoveries of platinum, iridium, and palladium decreased while the recovery of other metals increased can be attributed to the larger use of the by-metals, particularly osmium, as a hardener for platinum.

Secondary platinum metals recovered in the United States, 1916–1925, in troy ounces

Year	Platinum	Palladium	Iridium	Others	Total
1916	45,156	1,284	1,535		47,975
1917	59,007	3,347	9,832		72,186
1918	40,378	1,795	3,410		45,583
1919	54,545	3,467	3,504		61,516
1920	51,255	3,100	3,355		57,710
1921	39,131	4,887	1,776	229	46,023
1922	40,062	4,193	1,937	496	46,688
1923	39,152	6,246	2,021	453	47,872
1924	45,474	5,784	2,200	1,013	54,471
1925	35,578	4,680	1,827	1,189	43,274

IMPORTS AND EXPORTS

Platinum metals imported for consumption in the United States, 1916–1925

Year	Troy ounces	Value	Year	Troy ounces	Value
1916	63,795	$3,710,815	1921	78,378	$5,418,464
1917	35,773	2,957,197	1922	110,025	8,983,547
1918	56,756	5,167,908	1923	106,637	10,466,705
1919	68,054	6,747,447	1924	111,359	11,030,349
1920	100,546	10,617,440	1925	125,802	13,230,148

Platinum metals imported for consumption in the United States, 1924–1925, by metals

Metal	1924			1925		
	Troy ounces	Value		Troy ounces	Value	
		Total	Average		Total	Average
Platinum:						
Ores of platinum metals (platinum content)	1,890	$207,905	$110.00	757	$71,386	$94.30
Grains, nuggets, sponge, or scrap	61,952	5,937,792	95.85	58,718	5,725,015	97.50
Ingots, bars, sheets or plates, not less than one-eighth inch thick	31,871	3,678,416	115.42	47,002	5,504,068	117.10
	95,713	9,824,113	102.64	106,477	11,300,469	106.13
Manufactures of, except jewelry	17	2,367	139.24	62	6,991	112.76
Iridium	1,397	214,384	153.46	2,349	586,913	249.86
Osmiridium	1,446	174,460	120.65	3,236	446,276	137.91
Osmium	350	38,931	111.23	1,050	120,845	115.09
Palladium	10,388	624,478	60.12	8,296	483,349	58.26
Rhodium	1,166	105,770	90.71	2,476	169,687	68.53
Ruthenium	882	45,846	51.98	1,856	115,618	62.29
	111,359	11,030,349	99.05	125,802	13,230,148	105.17

Platinum metals imported into the United States in 1925, by countries, in troy ounces

[General imports]

Country	Platinum (grains, scrap, ingot, etc.)	Palladium	Iridium	Osmium and osmiridium	Rhodium and ruthenium	Total
Argentina	7					7
Australia	4			735		739
Austria	12					12
Canada	644	597			1,005	2,246
Chile	777					777
China	185					185
Colombia	33,595					33,595
Cuba	2					2
France	1,708		442	314	805	3,269
Germany	474		60	450		984
Greece	267					267
Japan	30					30
Latvia	6,000	200			60	6,260
Panama	1					1
Sweden	161					161
United Kingdom	62,607	7,499	1,847	2,787	2,462	77,202
Venezuela	4					4
	106,478	8,296	2,349	4,286	4,332	125,741

The metal imported from Panama and Colombia is crude, and that from Latvia, Poland, and Sweden is believed to be largely crude and of Russian origin. Part of the metal from the United Kingdom, France, and Germany is doubtless Russian crude, but the bulk is probably refined metal from Russian crude. The total value of platinum metals imported for consumption in 1925 was $13,230,148, an increase of 20 per cent as compared with 1924.

Exports of platinum in 1925 were 177 per cent greater in quantity and 161 per cent greater in value than in 1924.

Platinum exported from the United States, 1916–1925

Year	Unmanufactured		Manufactures of, except jewelry	
	Troy ounces	Value	Troy ounces	Value
1916	1,145	$97,988	(1)	$83,864
1917	3,445	234,433	(1)	65,415
1918	119	13,511	(1)	23,562
1919	522	75,066	(1)	54,529
1920	1,302	177,115	(1)	111,014
1921	3,272	244,473	741	85,216
1922 Crude, scrap, and old	143	13,149	486	35,967
1922 Ingots, sheets, wire, and alloys	1,313	127,047		
1923	1,151	128,599	592	65,073
1924	5,854	643,282	1,274	136,948
1925	16,234	1,787,122	3,537	249,975

[1] Quantity not recorded.

CONSUMPTION

According to reports from refiners, the consumption of platinum metals in the United States in 1925 was 176,602 ounces, an increase of 7 per cent as compared with 1924. The chemical industry increased its consumption 2,229 ounces, most of which was platinum. The electrical industry used 2,736 ounces more and the dental industry 3,068 ounces more than in 1924. The jewelry industry increased its consumption by 6,782 ounces, and used more osmium and rhodium than formerly and less palladium.

Platinum metals consumed in the United States as reported by refiners, 1924–25, by industries, in troy ounces

Industry	Platinum	Palladium	Iridium	Others	Total	Percentage of total
1924						
Chemical	10,507	436	122	403	11,468	7
Electrical	16,588	3,099	1,269	----------	20,956	13
Dental	11,092	10,049	131	----------	21,272	13
Jewelry	87,151	12,480	2,204	746	102,581	62
Miscellaneous	5,012	2,122	634	973	8,741	5
	130,350	28,186	4,360	2,122	165,018	100
1925						
Chemical	12,558	383	71	685	13,697	8
Electrical	18,845	3,157	1,579	111	23,692	13
Dental	9,293	14,952	95	----------	24,340	14
Jewelry	93,293	10,950	2,840	2,280	109,363	62
Miscellaneous	3,356	520	220	1,414	5,510	3
	137,345	29,962	4,805	4,490	176,602	100

STOCKS

Stocks of the platinum metals in the hands of refiners on December 31, 1925, amounted to 79,093 ounces, an increase of 6 per cent as compared with the stocks at the beginning of the year.

Stocks of platinum metals in the hands of refiners in the United States, December 31, 1918–1925, in troy ounces [1]

Year	Platinum	Palladium	Iridium	Others	Total
1918	51,504	10,086	3,224	----------	64,814
1919	29,228	10,235	3,359	610	43,432
1920	46,747	16,565	4,196	216	67,724
1921	38,514	21,042	4,991	3,113	67,660
1922	41,900	24,975	7,559	1,583	76,017
1923	36,554	26,266	5,208	2,697	70,725
1924	40,464	27,400	3,622	3,053	74,539
1925	44,024	26,740	3,720	4,609	79,093

[1] Figures not available prior to 1918.

MARKET AND PRICES

CRUDE PLATINUM

Sellers of domestic crude platinum reported they were paid for metal content based on assay, and no figure can be given for crude platinum. Buyers reported purchases at $90 to $130 an ounce for domestic and $71 to $112 for foreign crude platinum. Buyers of foreign and domestic crude platinum in the United States who reported purchases in 1925 are listed below:

American Platinum Works, 325 New Jersey Railroad Avenue, Newark, N. J.
Baker & Co. (Inc.), Murray and Austin Streets, Newark, N. J.
J. Bishop & Co., Malvern, Pa.
Sigmund Cohn, 44 Gold Street, New York, N. Y.
Goldsmith Bros. Smelting & Refining Co., 907 Hayworth Building, Chicago, Ill.
S. B. Gracier (Inc.), 608 Commercial Street, San Francisco, Calif.
Kastenhuber & Lehrfeld, 24 John Street, New York, N. Y.
Pacific Platinum Works (Inc.), 814 South Spring Street, Los Angeles, Calif.
R. & H. Platinum Works, 709 Sixth Avenue, New York, N. Y.
Shreve & Co., Post Street and Grant Avenue, San Francisco, Calif.
L. F. Waterman Co., New York, N. Y.
Wildberg Bros., 742 Market Street, San Francisco, Calif.
H. A. Wilson Co., 97 Chestnut Street, Newark, N. J.

REFINED METALS

The quoted prices [2] for refined platinum remained within the limits of $117 to $120 an ounce throughout the year; they were lowest from January to April, rose to $120 in May, and closed the year at that figure. It is believed that the average selling price of the year was $118. Iridium began the year at $325 an ounce, rose to $375 to $400 in April and to $400 by July, but declined to $395 in October with supplies short; the average selling price was approximately $385. Palladium opened the year at $79 to $83, declined to $75 to $83 in

[2] Engineering and Mining Journal-Press: Vols. 119, 120, 1925.

July, immediately rose, and in October was $80 to $83; the average selling price was $78. Osmium sold at $102, rhodium at $95, and ruthenium at $85 throughout 1925. The 5 per cent iridium alloy sold at an average of $130 an ounce, and the 10 per cent alloy at $143 an ounce.

WORLD'S PRODUCTION

Estimated world's production of crude platinum from placers, 1916–1924, in troy ounces

Country	1916	1917	1918	1919	1920	1921	1922	1923	1924
Australasia:									
New South Wales	82	259	607	213	796	249	80	586	646
Papua (osmiridium) [1]	(2)	(2)	(2)	(2)	100	360	100	[3] 145	[3] 119
Tasmania (osmiridium)	222	332	1,607	1,670	2,009	1,751	1,174	673	365
Canada [4]	60	80	40	30	25	15	15	10	5
Colombia [5]	25,000	32,000	35,000	35,000	35,000	35,500	40,000	42,000	46,000
India (British)	9	4	[6]						
Japan	70	127	51	155	258	231	150	224	145
Russia [5]	63,900	50,000	25,000	30,000	35,000	20,000	22,000	20,000	25,000
United States	750	605	647	824	613	977	1,008	609	335

[1] For year ended June 30 of year stated.
[2] Figures not available, but annual output did not exceed 10 ounces.
[3] Exports.
[4] Estimated by J. M. Hill. The Dominion Bureau of Statistics Ann. Repts. give the placer output of Canada as follows: 1916, 15; 1917, 57; 1918, 39; 1919, 25; 1920, 17; 1921, 23; 1922, 12; 1923, 7; 1924, 5.
[5] Estimated by J. M. Hill.
[6] Production, 0.31 ounce.

The following table gives data by which the figures showing the production of crude platinum as given above can be reduced to terms of the refined metals used by the industries:

Average assay of crude platinum, in per cent

Country	Platinum	Palladium	Iridium	Osmium	Rhodium, ruthenium, etc.
Australasia:					
New South Wales	75.9		1.3		1.3
Papua			58.1	33.5	3.0
Tasmania			58.1	33.5	3.0
Canada	72.1	0.2	1.1		2.8
Colombia	96.2	.5	1.1		1.4
Japan	.2		49.8	37.3	3.9
Russia	83.5	1.9	1.9	3.0	.6
United States	85.5	.6	1.1	1.3	1.0

PROPOSED STATUTORY DEFINITION OF PLATINUM

At a meeting of jewelers held on September 12, 1925, at the National Jewelers Board of Trade, New York, a draft of a proposed platinum stamping law was read and accepted. The text is quoted here in full because of its bearing on the platinum industry of the United States.

PROPOSED PLATINUM LAW [3]

1. This act may be cited as the national platinum marking act, 1924.
2. In this act, unless the context otherwise requires:
(a) "Article" means any article of merchandise, and includes any portion of such article, whether a distinct part thereof or not (including every part

[3] The Jewelers' Circular, "Proposed platinum law": Vol. 91, Sept. 16, 1925, pp. 81–83.

thereof whether or not separable and also including material for manufacture) appearing or purporting to contain platinum, iridium, palladium, ruthenium, rhodium, and/or osmium alone or in conjunction.

(b) Platinum, iridium, palladium, ruthenium, rhodium, and/or osmium, include any alloy or alloys of any one or more of said metals, or any metal or alloy appearing or purporting to be or having the same appearance as platinum or any one or more of the aforementioned metals.

(c) "Mark" means any mark, sign, device, imprint, stamp, brand, tag, card, paper, label, box, carton, container, holder, package, cover, or wrapping attached to, used in conjunction with, or inclosing such article or any bill, bill of sale, invoice, statement, letter, circular, advertisement, notice, memorandum, or other writing or printing, describing, identifying or referring to, or appearing or purporting to describe, identify, or refer to the quality, quantity, and/or weight of platinum, iridium, palladium, ruthenium, rhodium, and/or osmium.

(d) "Apply" and "applied" include any method or means of application or attachment to, or of use on, or in connection with, or in relation to, an article, whether such application, attachment, or use is to, on, by, in, or with—

(I) the article itself, or
(II) anything attached to the article, or
(III) anything to which the article is attached, or
(IV) anything in or on which the article is, or
(V) anything so used or placed as to lead to a reasonable belief that the mark on that thing is meant to be taken as a mark on the article itself.

(e) "To sell" means—

(*a*) Import or cause to be imported into the United States, or
(*b*) Deposit or cause to be deposited in the United States mail, or
(*c*) Transport or cause to be transported from one State, Territory, or possession of the United States, or from the District of Columbia, into any other State, Territory, or possession of the United States, or into the District of Columbia, or
(*d*) Deliver or cause to be delivered to any carrier to be so transported, or
(*e*) Sell or offer or expose for sale, or cause to be sold or offered or exposed for sale, in any Territory or possession of the United States, or in the District of Columbia.

3a. When an article is composed of mechanism, works, or movements, and of a case or cover containing the mechanism, works, or movements, a mark applied to the article shall be deemed not to be, nor to be intended to be, applied to the mechanism, works, or movements.

3b. A mark applied to the article shall be deemed not to apply to springs, winding bars, sleeves, crown cores, joint pins, screws, rivets, dust bands, movement rings, brooch pins, lapel-button backs, and the posts to which they are attached, joints, catches, scarf pin stems, hat pin stems, and hat pin sockets.

4. If an article under this act has applied to it any mark, it must have applied to it the following marks:

(*a*) A trade-mark duly registered under the laws of the United States of the manufacturer of such article, except that if such manufacturer has sold, or contracted to sell, such article to a jobber, wholesaler, or retail dealer, regularly engaged in the business of buying and selling similar articles, this provision shall be deemed to be complied with if there is so applied, in the place and manner specified in this action, the trade-mark, duly registered under the laws of the United States, of such jobber, wholesaler, or retail dealer, respectively.

(*b*) If the article has applied to it marks conforming with the requirements of subdivision (*a*) of this action, it may also have applied to it numerals intended to identify the article or pattern, and not calculated to mislead or deceive, provided that they are not incorporated with the quality mark.

5. All marks applied to any article shall be equally visible, legible, clear, and distinct and no quality mark which is false, deceptive, or misleading shall be applied to any article or to any descriptive device therefor. No more than one quality mark shall be applied to any article and such quality mark shall be applied to such article in only one place thereon.

6. There shall not be applied to any platinum, iridium, palladium, ruthenium, rhodium, and/or osmium article any mark indicating or purporting or intending to indicate that the platinum, iridium, palladium, ruthenium, and/or osmium in

the article is of a higher quality than it really is, nor any quality mark or any colorable imitation thereof, or contraction or addition thereto except as follows:

(*a*) An article consisting of at least 985/1000ths parts of platinum, iridium, palladium, ruthenium, rhodium, and/or osmium, where solder is not used and at least 950/1000ths parts of said same metal or metals where solder is used, may be marked "platinum," provided that the total of the aforementioned metals other than pure platinum shall amount to no more than 50/1000ths parts of the contents of the entire article.

(*b*) An article consisting of at least 985/1000ths parts of platinum, iridium, palladium, ruthenium, rhodium, and/or osmium, where solder is not used and at least 950/1000ths parts of the said same metal or metals where solder is used, and provided further that at least 750/1000ths parts of said article are pure platinum, may be marked "platinum" provided immediately preceding the mark "platinum" there is marked the name or abbreviation as hereinafter provided, of either iridium, palladium, ruthenium, rhodium, and/or osmium, whichever of said metals predominates, and it is further provided that such predominating other metal must be more than 50/1000ths parts of the entire article.

(*c*) An article consisting of at least 985/1000ths parts of platinum, iridium, palladium, ruthenium, rhodium, and/or osmium, where solder is not used and at least 950/1000ths parts of said same metals where solder is used, provided more than 500/1000ths parts of said article consists of pure platinum, may be marked and sold with the word "platinum," provided that said word is immediately preceded by a decimal fraction in one-thousandths showing the platinum content in proportion to the content of the entire article, and further provided that said mark "platinum" be followed by the name or abbreviation as herein allowed, of any one or more of the following metals, to wit: Iridium, palladium, ruthenium, rhodium, and/or osmium, that may be present in the article in quantity of more than 50/1000ths parts of the entire article. The name of such other metal or metals other than platinum, however, shall each be immediately preceded by a decimal fraction in one-thousandths showing the content of such other metal or metals in proportion to the entire article—as, for example, 600 plat., 350 pall., or 500 plat., 200 pall., 150 ruth., 100 rhod.

(*d*) An article consisting of 950/1000ths parts of the following metals: Platinum, iridium, palladium, ruthenium, rhodium, and/or osmium with less than 500/1000ths parts of the entire article consisting of pure platinum, may be marked with the name iridium, palladium, ruthenium, rhodium, and/or osmium, whichever predominates in the said article, but in no event with the mark "platinum," provided, however, that the quantity of such metal other than platinum so marked, must be marked in decimal thousandths, and provided further that the name of any such metal other than platinum so used must be spelled out in full irrespective of any other provisions of this act to the contrary.

7. Whenever provided for in this act, except where specifically excepted, the word "platinum" may be applied by spelling it out in full or by the abbreviation "plat."; the word "iridum" may be applied by spelling it out in full or by the abbreviation "irid."; the word "palladium" may be applied by spelling it out in full or by the abbreviation "pall."; the word "ruthenium" may be applied by spelling it out in full or by the abbreviation "ruth."; the word "rhodium" may be applied by spelling it out in full or by the abbreviation "rhod."; and the word "osmium" may be applied by spelling it out in full or by the abbreviation "osmi."

8. Any person, partnership, corporation, or association, or any officer, director, employee, or agent thereof who shall sell any article to which is applied any mark which does not conform to all the provisions of this act, shall be guilty of a misdemeanor and upon conviction thereof, shall be punished by a fine of not more than $1,000, or by imprisonment for not more than six months, or by both such fine and imprisonment in the discretion of the court.

9. In any action relating to the enforcement of any provisions of this act, a certificate duly issued by an assay office of the Treasury Department of the United States, certifying the weight of any article, or any part thereof, or of the kind, weight, quality, fineness, or quantity of any ingredient thereof, shall be receivable in evidence as constituting prima facie proof of the matter or matters so certified.

10. In any action relating to the enforcement of any provision of this act, proof that an article has been marked in violation of the provisions of this

act shall be deemed to be prima facie proof that such article was manufactured after this act became effective.

11. This act shall become effective, and shall not apply to any article manufactured prior to six months after its passage.

12. If any part of this act, or the application thereof to any particular situation, is held by any court of competent jurisdiction to be invalid on account of unconstitutionality, such adjudication shall not affect the remainder of this act, or the application of such first-mentioned part of this act to any other situations.

METALLURGY

Davis [4] has recently given detailed information as to the procedure for assaying palladium-bearing copper concentrates, such as those produced at the Salt Chuck mine, in southeast Alaska.

NOTES ON PLATINUM DEPOSITS

UNITED STATES

The Salt Chuck mine, Prince of Wales Island, Alaska, was in operation during the year and was reported [5] as milling 350 tons of palladium-bearing copper ore a day. From this mine 4,000 to 4,500 ounces of palladium is recovered a year. At various placers in Alaska a total of 12 ounces of crude platinum was recovered.

In California the production of crude platinum increased to 312 ounces, as compared with 285 ounces in 1924. The dredges along the base of the Sierras were the largest producers. The rank of the producing counties was: Sacramento, Butte, Yuba, Stanislaus, Calaveras, and Shasta. Although much sniping was done on various streams, little platinum was recovered by surface working.

In Oregon 19 ounces of crude platinum was recovered by miners in 1925 as compared with 20 ounces in 1924. The largest production was made on the beaches near Sixes, Curry County, and near Bullards, Coos County. Some platinum was recovered by the Superior dredge near Bridgeport, Baker County.

So far as has been learned, no concentrates were shipped from the Rambler mine in Albany County, Wyo., in 1925. The mine has reverted to the Rambler Consolidated Mines Corporation by the winning of its suit against the Electrolytic Copper Co., which purchased a tax deed to the mine some years ago.[6]

Hess,[7] as a result of his examination of the Centennial district in 1923 and 1924, concludes that—

> Platinum metals, in very small quantities, are undoubtedly present on Centennial Ridge. At some places there may be larger masses of rich ore than the small pockets found in the middle Schnitzler tunnel, but the writer believes the chances for such discoveries are too few to warrant the expenditure of money, time, or labor.
>
> The mineral or minerals in which the platinum metals occur is unknown. Both sulphur and arsenic were present in one specimen tested, and there is much iron stain in the schist immediately surrounding the mineral mass extracted from the Schnitzler tunnel. The minerals may have been sperrylite scattered through iron sulphide. In sperrylite any of the platinum metals probably may take the place of platinum.

---

[4] Davis, C. W., Analysis of Copper–Palladium–Gold–Silver Concentrates: Repts. of Investigations, Bureau of Mines, Serial 2731, February, 1926.

[5] Engineering and Mining Journal-Press: Vol. 121, 1926, p. 339. Mining Truth, Feb. 16, 1926, p. 7.

[6] Engineering and Mining Journal-Press: Vol. 121, 1926, p. 378.

[7] Hess, Frank L., Platinum Near Centennial, Wyoming: U. S. Geol. Survey Bull. 780, 1926, pp. 127–135.

AUSTRALASIA

A new deposit carrying osmiridium is reported found on Adams River, Tasmania.[8] The area is said to be about 15 square miles and seems to be rich. Nothing has been heard recently concerning osmiridium in the Province of Papua.

CANADA

There has been considerable activity in the Tulameen district, British Columbia, during 1925, and a $1,000,000 English company was organized to work the gravels.[9]

It is reported[10] that platinum has been found in the gravels of Slave River, from Fort Smith to Fort Chippewayan, and near Caribou Island.

COLOMBIA

The estimated[11] output of platinum in Colombia in 1925 was 62,000 ounces. It is believed that at least 46,000 ounces was produced in 1924.

The South American Gold & Platinum Co., which received permission from the Colombian Government to work the El Salto property, had three dredges in operation,[12] and completed its hydroelectric plant on the Andagada River.

The British Platinum & Gold Corporation (Ltd.) rebuilt its dam on the Opogodo, destroyed by flood, and No. 1 boat was again at work. The No. 2 dredge was rebuilt with a larger stacker.[13]

The Colombia Platinum & Gold Dredging Co. was idle.

JAPAN

There is no news concerning the Japanese osmiridium fields other than the record of mineral production of Japan, which shows that 145 ounces of platinum dust, valued at 48,064 yen, equivalent to approximately $20,000, was produced in 1924.

RUSSIA

The platinum output of Russia is still small and the exact quantity is uncertain; in 1924 it may have reached 25,000 ounces. Early in 1925 the chief engineer of the Russian Platinum Trade Trust, Peter Drozgiloff, was in the United States to purchase new equipment for the Ural platinum mines. He said in a letter to the author that during 1924 there were 25 dredges busy in the Urals, but he could not estimate the output. Five dredges ordered from the Yuba Manufacturing Co., of San Francisco, were shipped from Marysville, Calif., during the latter part of 1925.[14] They are all electrically operated, four have 13½-cubic-foot buckets, and one has 7½-cubic-foot buckets.

---

[8] Mining Magazine (London): Vol. 33, 1925, p. 356. Jewelers' Circular: Vol. 91, 1925, p. 87; vol. 92, 1926, p. 51.
[9] Mining Truth: 10th year, Jan. 2, 1926, p. 21.
[10] Engineering and Mining Journal-Press: Vol. 121, 1926, p. 415.
[11] Engineering and Mining Journal-Press: Vol. 121, 1926, p. 420. Commerce Reports: Apr. 26, 1926, p. 247.
[12] Mining Magazine (London): "Reports of consolidated gold fields of South Africa": Vol. 23, December, 1925, pp. 19–20, advertising section.
[13] Mining Magazine (London): Vol. 33, 1925, p. 135.
[14] Engineering and Mining Journal-Press: Vol. 120, 1925, p. 835.

TRANSVAAL

The first recovery of osmiridium from the Banket ores began in 1921, when corduroy tables were introduced. The production in that year was 510 ounces. In 1922 the yield was 762 ounces, in 1923 it was 1,784 ounces, in 1924 it was 4,107 ounces, and 6,055 ounces of osmiridium were recovered in 1925.[15] The Witwatersrand Cooperative Smelting Works near the Robinson mine, Fordsburg, have been recovering 30 ounces of osmiridium a month for the last two years on Wilfley tables during the re-treatment of accumulated slimes.[16]

During 1925 in both South Africa and London there was considerable speculation in platinum and many companies with large capital were organized, but the boom collapsed by the end of the year. The deposits in the Lydenburg district have been described by Wagner[17] and there seems to the writer every reason to believe that this will prove to be a platinum-producing district of the first importance. Much study has been given these ores. Stanley and Wagner[18] find that the platinum from Waterberg district shows a zonal growth, which they intimated may be due to deposition from colloidal solutions. The Lydenburg platinum, on the contrary, is in bright metallic grains with some inclusions.

Holman[19] has published a paper on the metallurgy of these ores and concludes that the problem is a real one because of the extremely large concentration ratio that must be maintained. He suggests that a combined gravity concentration, followed by smelting with lead or by a chemical treatment, may be required.

During the year it was announced that the Consolidated Gold Fields of South Africa had become interested in some of the more important of the platinum localities through its subsidiary, the Lydenburg Platinum Areas (Ltd.). The first report of this company[20] indicates that much real work has been done under competent direction.

In March (1926) the first record of actual platinum production was announced in the United States,[21] the total being 150 ounces.

Recently the results of an independent engineering examination of the South African situation were made known by Newberry and Kemp.[22] This report points out the difficulties to be encountered in mining, metallurgy, and economics, but says that there are many deposits in the 3,000 square miles of the district that will prove attractive with platinum at £24 an ounce. The authors express the belief that platinum prices will decline to such a level that the poorer deposits can not be worked, and conclude that the output of the field in 1926 should be 18,000 ounces and 80,000 to 100,000 ounces by 1927.

---

[15] Commerce Reports: Apr. 12, 1926, p. 99.
[16] Engineering and Mining Journal-Press: Vol. 121, 1926, p. 420.
[17] Wagner, P. A., South African Jour. of Ind., Feb., 1925. Mining Magazine (London): Vol. 32, 1925, pp. 239–245.
[18] Stanley, G. H., and Wagner, P. A., Jour. Chem., Met., and Min. Soc., South Africa, March, 1925. (Original): Mining Magazine (London): Vol. 33, 1925, pp. 56–58.
[19] Holman, B. W., "The treatment of platinum ores": Mining Magazine (London), vol. 32, 1925, pp. 283–285.
[20] Mining Magazine (London): Vol. 33, 1925, p. 131.
[21] Commerce Reports: Mar. 8, 1926, p. 572.
[22] Newberry, A. W., and Kemp, J. F., "Platinum in the Transvaal and elsewhere": Engineering and Mining Journal-Press: Vol. 121, 1926, pp. 717–725, 763–768.

TIN

By J. W. Furness [1]

GENERAL STATEMENT

The output of tin of domestic origin in the United States in 1925 was approximately equivalent to 13.8 short tons of metallic tin contained in 22.2 tons of ore or concentrates, derived wholly from Alaska.[2] The tin placers of the Nome district produced concentrates containing 9.75 tons of metallic tin. The balance was produced as a by-product from gold placer mining in the Hot Springs district on the lower Tanana River. Up to and including 1925, the approximate total output of tin mined in the United States is 1,250 tons. The imports of tin in 1925 were 85,843 short tons, valued at $95,121,111; the recovery of secondary tin amounted to 30,950 tons, making a total supply of 116,793 tons available for consumption.

DOMESTIC PRODUCTION

Tin mined in the United States (including Alaska), 1916–1925, in short tons

[Metallic tin obtainable from concentrates produced in tin mining]

1916	140	1921	4
1917	110	1922	1. 4
1918	69	1923	1. 9
1919	56	1924	7
1920	22	1925	13. 8

Smelter output of metallic tin in the United States, 1916–1925, in short tons

1916	2, 261	1921	11, 542
1917	6, 065	1922	9, 108
1918	10, 284	1923	7, 466
1919	12, 236	1924	486
1920	17, 652	1925	------

IMPORTS AND EXPORTS

Tin concentrate imported into the United States, 1916–1925

[General imports]

Year	Short tons	Value	Year	Short tons	Value
1916	8, 040	$4, 032, 460	1921	15, 340	$5, 672, 861
1917	9, 054	4, 743, 099	1922	13, 804	5, 504, 434
1918	18, 394	11, 444, 401	1923	3, 015	2, 169, 055
1919	19, 196	11, 871, 948	1924	[a] 174	71, 094
1920	34, 148	18, 795, 162	1925	[a] 214	98, 489

[a] Recorded as tin content.

[1] Figures on imports and exports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

[2] Data from the United States Geological Survey.

Tin content of tin ore, cassiterite, and black oxide of tin imported into the United States, 1924–25, by countries

[General imports]

Country	1924		1925	
	Short tons	Value	Short tons	Value
Bolivia	2	$1,034	29	$3,702
Canada	99	40,184	70	35,468
Chile			6	3,225
Finland	5	2,173		
United Kingdom	68	27,703	109	56,094
	174	71,094	214	98,489

Metallic tin imported for consumption in the United States, 1916–1925

Year	Short tons	Value	Year	Short tons	Value
1916	69,035	$51,802,232	1921	27,101	$16,645,719
1917	72,166	63,860,340	1922	67,416	40,797,986
1918	71,254	93,144,218	1923	77,206	61,092,354
1919	44,849	50,890,019	1924	72,866	68,953,193
1920	62,795	73,440,872	1925	85,843	95,121,111

Metallic tin (bars, pigs, blocks, grains, and granulated) imported into the United States, 1924–25, by countries

[General imports]

Country	1924		1925	
	Short tons	Value	Short tons	Value
Africa (Portuguese East)			129	$131,770
Australia	661	$630,248	818	878,485
Belgium			17	19,667
Canada	35	30,405	45	21,671
China	73	67,383	465	509,911
France			23	27,943
Germany	716	670,395	54	60,964
Hongkong	2,349	2,241,051	4,154	4,401,050
India (British)			6	5,664
Ireland	168	164,562		
Italy			[1]	14
Japan	28	29,476		
Java and Madura	1,134	1,108,660	280	302,126
Mexico			2	660
Miquelon and St. Pierre Islands			41	47,647
Netherlands	2,825	2,922,226	4,631	5,264,951
Philippine Islands			56	59,146
Straits Settlements	50,938	47,844,455	54,964	60,612,397
Sweden			151	169,877
United Kingdom	13,939	13,244,332	20,007	22,607,168
	72,866	68,953,193	85,843	95,121,111

[1] Less than 1 ton.

Metallic tin exported from the United States, 1916–1925, in short tons

Year	Domestic [1]	Foreign [2]	Year	Domestic [1]	Foreign [2]
1916	346	157	1921	1,154	406
1917	206	88	1922	901	329
1918	20	264	1923	840	331
1919	306	76	1924	469	605
1920	706	333	1925	404	639

[1] Imported as ore and exported as pigs, bars, etc.
[2] Imported as pigs, bars, etc., and exported as such.

Figure 2 shows the tin ore and metal imported and the secondary tin recovered in the United States, 1916–1925.

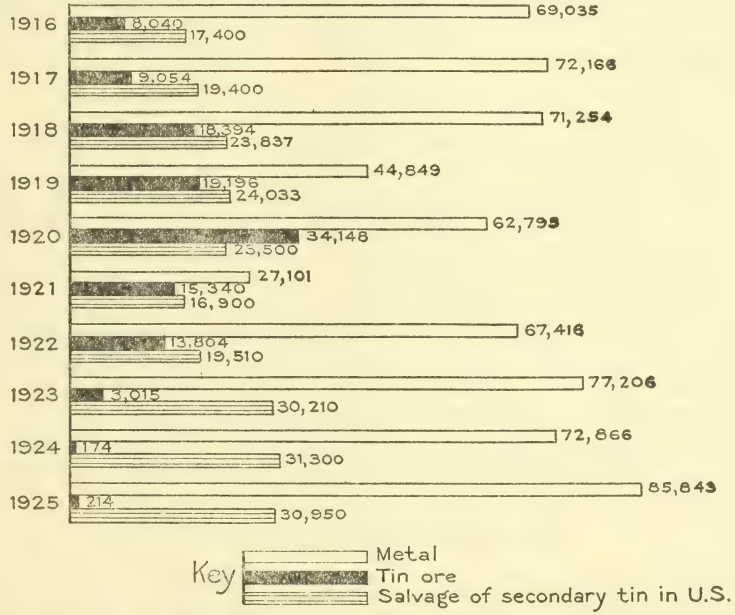

FIGURE 2.—Tin ore and metal imported, compared with secondary tin recovered in the United States, 1916–1925, in short tons

DOMESTIC SITUATION

The status of tin mining in this country, judged by production in the past, permits only one conclusion—under known methods of mining the United States does not possess a minable supply. Tin, however, can not be considered a rare metal. The occurrences are known and indications of tin of academic interest have been found in 16 States and Alaska. Thus one might infer that the tin-mining industry has not as yet come into its own; but during the last 60 years prospecting for tin has been carried on diligently and the known occurrences of tin are small. The price of tin during the last 40 years has fluctuated from \$0.12⅝ a pound in 1896 to \$1.10 a pound in 1918. If price were the major factor, and if the United States contained bodies of tin minable at any price heretofore reached, it seems reasonable to suppose that the production of the metal would have resulted during some, at least, of the periods of high prices. The first five districts described below constitute the major occurrences of tin in the United States.

CALIFORNIA

The first discovery of tin in what is now the United States was made in southern California in 1840. Cassiterite was found on the property then known as El Rancho Sobrante de San Jacinto, in San Bernardino County. In 1868 the San Jacinto Tin Mining Co. was formed. A hundred thousand dollars were expended and a few tons of tin were produced. In 1890 an English corporation, the San Jacinto Estate (Ltd.), took over the property. The Cajalco mine of this estate produced 6,000 tons of ore which yielded 120 tons of metallic tin. This mine was developed to a depth of 150 feet, and in all about 1,100 feet of drifting was done. After an expenditure of a sum said to be $800,000, including the purchase price of $450,000, the mine was closed in 1892. Since then no work has been done on the property.

VIRGINIA

In 1883 tin ore was discovered in place in Rockingham County, Va., at the headwaters of Irish Creek. The ore, cassiterite, occurs in narrow quartz veins and as replacements of granite. The geology of the area has been described by Ferguson.[3] The principal mine, known as the Cash Creek, is 7 miles east of Vesuvius station on the Norfolk & Western Railroad. In 1918 this property was examined by engineers of the Bureau of Mines at the initiative of the War Industries Board. Because of litigation, commandeering was threatened and the necessary legal papers were actually drawn. In consequence of the threat, litigation ceased and commandeering was not necessary. A Boston company took over the property, did some development work, found the ore bodies disappointing in both size and metallic content, and the enterprise was finally abandoned without production.

NORTH AND SOUTH CAROLINA

In 1886 tin ore was found in place in Cherokee County, S. C. The principal mines are the Ross mine, near Gaffney, S. C., and the Jones mine, 9 miles north of Kings Mountain, N. C. The Ross mine has produced upward of 40 tons of ore of fair grade.[4] In the summer of 1917 this area was examined by T. H. Leggett, on behalf of the United States Government. In his report, submitted under date of October 8, 1917, he says: "The conclusion is irresistible that tin ore does not exist in this belt in sufficient quantities to permit of a commercially successful operation."

SOUTH DAKOTA

In the early seventies stream tin was found in small quantities in the sluice boxes of the placer miners who were working in the Nigger Hill district of South Dakota. In 1917 during the intensive search for tin properties by the United States Government the Black Hills of South Dakota were examined by R. R. Horner

[3] Ferguson, H. G., Tin Deposits Near Irish Creek, Va.: Virginia Geol. Survey Bull. 15–A, 1918.
[4] Hess, F. L., and Graton, L. C., "The occurrence and distribution of tin." U. S. Geol. Survey Bull. 260, 1905, p. 164.

and Thomas Varley, of the Bureau of Mines. A manuscript report [5] was made entitled "Tin deposits of the Black Hills of South Dakota," from which the following excerpts are freely quoted: "The tin-bearing areas of this region are divided into two districts, known as the Northern Hills, in Lawrence County, with Tinton as a center, and the Southern Hills, in Pennington County, with Hill City as the center. The two districts are about 60 miles apart, the famous Homestake gold belt lying about midway between. In 1883 the cassiterite-bearing pegmatites were discovered near Tinton and about the same time tin was found in place in the Southern Hills near Keystone. These discoveries created intense excitement; in a short time the region was flooded with prospectors and hundreds of claims were staked in both localities. The southern district, owing to its accessibility, seems to have been most favored."

Many mining companies were organized, a large amount of development work done, mills were erected and thoroughly equipped. After some years of futile operation, however, both mines and mills were closed down and abandoned, having proved complete failures. Horner [5] says: "This was due to extravagance and incompetent management in part, but mainly to the low-grade and spotted nature of the tin-bearing deposits." The ore occurs in irregular bunches and small shoots. Although these contain enough cassiterite to constitute payable ore, as a rule the quantity available is unimportant, and within a few feet in any direction the tin content vanishes. This erratic occurrence of the cassiterite in the pegmatite matrix renders the material as a whole too low grade to be exploited profitably, and the comparatively small extent and uneven distribution of the ore shoots make selective mining out of the question.

Hess [6] has reviewed the history and given a description of the tin, tungsten, and tantalum deposits of South Dakota. He [6a] says:

> The tin deposits of the Black Hills occur in pegmatites and in quartz. They are nowhere equally disseminated but occur in shoots. * * * The shoots of profitable tin-bearing rock are ordinarily of small cross section and of uncertain length (depth), and their occurrence in narrow dikes necessarily means that in general, except possibly at Tinton, they can be worked only on a small scale at each place and not, as so often advertised, that "all that is needed to make them pay is to work them as low-grade propositions on a big scale."

ALASKA

Alaska has yielded by far the largest part of the total tin production attributed to the United States. The occurrence and character of the properties from which tin has been shipped are fully described by Brooks, Collier, Hess, Knopf, and Eakin in United States Geological Survey Bulletins 229, 358, 480–C, 520–B, and 622–B.

OTHER STATES

Occurrences of tin of academic interest have also been found in the following States: Alabama, Connecticut, Georgia, Idaho, Maine, Massachusetts, Montana, Nevada, New Hampshire, New Mexico, Texas, Washington, and Wyoming.

---

[5] Horner, R. R., and Varley, Thomas: Unpublished report, Bureau of Mines files, 1918.

[6] Hess, F. L., "Tin, tungsten, and tantalum deposits of South Dakota": U. S. Geol. Survey Bull. 380, pp. 131–163.

[6a] Under "Summary, comparison, and conclusions," U. S. Geol. Survey Bull. 380, p. 147.

Alabama.—Cassiterite is found near Ashland, Clay County, in the Broad Arrow mine. The country rock is gneiss, with micaceous and talcose schist.[7] Tin has also been found near Rockford in Coosa County.[8]

Connecticut.—Tin ore has been reported near Haddam.[9]

Georgia.—Tin ore occurs in Lumpkin County as placer tin associated with gold. It also occurs in granite and chloritic schist.[10]

Idaho.—Cassiterite occurs near Jordan Creek in the Coeur d'Alene district,[11] and as wood tin in the gravel of Panther Creek, Lemhi County.

Maine.—Cassiterite has been found at Winslow in small veins which traverse impure limestone,[12] and it has also been found in a number of pegmatites near Paris and Buckfield.

Massachusetts.—A few crystals of cassiterite have been found at Goshen and Chesterfield.[13]

Montana.—Stream tin has been found in Prickly Pear, French Bar, and Tenmile Creek in the basin of Basin Gulch and Peterson Creek.[14] Stream tin has also been recovered from gold dredges in the Madison River.

New Hampshire.—Cassiterite was found at Lynn and Jackson in 1840 by the first State geologist, Dr. Charles T. Jackson. It occurs with arsenical and copper pyrite, fluorspar, and phosphates of iron in small quartz veins.[15]

Texas.—Cassiterite occurs as a replacement deposit in granite in the Franklin Mountains near El Paso,[16] and efforts have been made to work the deposit.

Washington.—Tin deposits occur in a pegmatite dike, 12 miles south of Spokane.[17]

Wyoming.—At Nigger Hill, northwestern portion of the Black Hills, cassiterite has been found in a granite area.[18]

USES

TIN PLATE AND TERNEPLATE

The following table was compiled under the direction of the war mineral investigation division of the Bureau of Mines in 1918 in order to show the proportion of tin plate consumed in the various uses:

---

[7] Rolker, C. M., The Production of Tin: 16th Ann. Rept., U. S. Geol. Survey, pt. 3, p. 528.

[8] Phillips, W. B., A Preliminary Report on a Part of the Lower Gold Belt of Alabama: Geol. Survey of Alabama, Bull. 3, 1893, p. 28.

[9] Fawns, Sidney, Tin Deposits of the World, London, 1905, p. 158.

[10] Census Office, Mineral Industries of the United States: Eleventh Census, 1892, pp. 249–265.

[11] Campbell, Stewart, Twenty-fifth Annual Report of the Mining Industry of Idaho, 1923, p. 37.

[12] Jackson, C. T., "On the discovery of a new locality for tin ore in Winslow, Me.": Proc. Boston Soc. of Nat. Hist., vol. 12, 1869, p. 267; Hunt, T. S., "Remarks on the occurrence of tin at Winslow, Me.": Trans. Am. Inst. Min. Eng., vol. 1, 1873, p. 373.

[13] Dana, J. D., System of Mineralogy, 1889, p. 769.

[14] Raymond, R. W., Remarks following a paper by T. S. Hunt on "Tin in mines": Trans. Am. Inst. Min. Eng., vol. 1, 1873, p. 374.

[15] Jackson, C. T., Report of the State Geologist of New Hampshire, 1842, p. 241.

[16] Dumble, E. T., Second Ann. Rept. Texas Geol. Survey, 1890, pp. 595, 690–713.

[17] Collier, A. J., "Tin ore at Spokane, Wash.": U. S. Geol. Survey Bull. 340, pt. 1, 1908, pp. 295–305.

[18] Rolker, C. M., "Production of tin in various parts of the world": U. S. Geol. Survey 16th Ann. Rept., 1895, pt. 3, p. 530.

Percentage of distribution of tin plate for various uses

Required for—	Per cent	Required for—	Per cent
Containers for food and edible products:		Containers for products other than edibles:	
Vegetables and fruit	22.0	Oil and grease	7.0
Milk, condensed or evaporated	13.0	Tobacco, cigars, cigarettes, and snuff	4.0
Fish	5.5	Paint and varnish	1.6
Meat	4.5	Pharmaceutical drugs	1.0
Sirups and molasses	3.5	Polish (stove, shoe, and metal)	.7
Butter, lard, and compounds	2.4	Typewriter ribbons	.1
Baked beans	2.3	Toilet articles (talcum, etc.)	.5
Soups	1.5	Total	14.9
Baking powder	1.4		
Crackers	1.3		
Coffee, tea, and substitutes	1.2		
Miscellaneous food, including fresh oysters and fresh crabmeat	.8	Miscellaneous uses of tin plate:	
Cocoa and spice	.8	Export	16.5
Kraut	.8	War munitions, including case linings, fuse boxes, shrapnel cases, stove boards, furnace pipe, gas meters	.8
Oils (olive, salad, cooking)	.7		
Hominy	.3		
Tomato pulp (5 gallons)	.3		
Candy	.2		
Spaghetti and macaroni	.1	Total	17.3
Total	62.6	Unclassified:	
		Caskets, metal stamps	2.0
Tin-plate products used in connection with food or food containers:		Grand total	100.0
Bottle and jar caps	1.8		
Cooking utensils	1.4		
Total	3.2		

The United States is the greatest consumer of metallic tin and the greatest manufacturer of tin products. Upward of 52 per cent of the world's production of tin finds it way into this country. The most important use of tin is in the manufacture of tin plate. The chief centers of this industry are in the United States and South Wales. Tin plate is made by applying a light film of tin to thin rolled sheets of mild steel. The coated sheets are used to make tin cans or containers, cooking utensils, or other ware. In the manufacture of tin plate, the thin sheets of rolled steel are covered with a black scale of iron oxide. This is removed by a bath of warm diluted sulphuric or hydrochloric acid; then the plates rubbed with sand and water, annealed, cold-rolled, reannealed, immersed in diluted sulphuric acid, rubbed with sand, and then washed with water. While wet they pass through the tinning machine, which usually has two compartments separated by a division that does not reach the bottom. The molten tin in the lower part of the machine is covered by a flux of zinc chloride in the first compartment and by melted grease (palm oil) in the second compartment. The plates pass through the flux down through the tin and up through the grease; then they go to rolls which remove the superfluous tin and give a smooth bright surface.

Palm oil is imported from the West Coast of Africa, and is a British monopoly. The ratio of consumption is 1 ton of palm oil to 250 tons of tin plate or terneplate. No satisfactory substitute for this oil is known. During 1918 the American Can Co. at Sparrows Point, Md., experimented with hydrogenated cottonseed oil, but found it an incomplete substitute.

Thirty-five years ago, except for a small output from France and Germany, virtually all tin plate was produced in South Wales. At that time the Cornish mines were contributing a considerable quota

to the tin output of the world. The canneries of the United States purchased large quantities of Cornish tin plate because it could be bought at less than the cost of manufacture of American tin plate.

On July 24, 1897, an enactment was passed entitled "An act to provide revenue for the Government and to encourage the industries of the United States." Paragraph 134 of this act placed a tariff of 1½ cents per pound upon tin plate, terneplate, and taggers tin. This act did not enable the American tin-plate manufacturers to meet foreign competition, and the American tin-plate manufacturers in order to obviate this asked Congress for a higher protective tariff. In 1890 the McKinley Tariff Act was passed, which imposed a duty of 55 per cent ad valorem on tin plate. This act was followed by the tariff acts enumerated: 1909, paragraphs 130 to 136, rate 1.2 cents per pound; 1913, paragraphs 109 to 116, 15 per cent ad valorem; and 1922, paragraphs 310 to 312, rate 1 cent per pound. Sections 1 to 4, act of 1897, which includes paragraphs 138 to 140, were repealed by section 41, act of 1909. The act that was passed in 1922 applied a 1 cent per pound duty to the following:

Sheets or plates of iron or steel, or taggers iron or steel, coated with tin or lead, or with a mixture of which these metals, or either of them is a component part, by the dipping or any other process, and commercially known as tin plates, terneplates, and taggers tin. (Par. 310.)

No article not specially provided for which is wholly or partly manufactured from tin plate, terneplate, or sheet, plate, hoop, band, or scroll iron or steel, or of which such tin in plate, terneplate, sheet, plate, hoop, band, or scroll iron or steel shall be the material of chief value, shall pay a lower rate of duty than that imposed on tin plate, terneplate or sheet plate, hoop, band, or scroll iron or steel, from which it is made, or of which it shall be the component thereof of chief value. (Par. 311.)

Since the enactment of the McKinley Tariff Act, the American industry has prospered and to-day, in spite of the fact that the United States produces practically no tin, the domestic tin-plate industry is the largest in the world, producing slightly in excess of 40,000,000 boxes a year. The Cornish production is approximately half this figure. Prior to the war, Germany's productive capacity about equaled her needs. In India, Spain, Italy, and Japan large works have been put in operation. Of all the countries mentioned, Great Britain alone controls its source of tin. The Welsh production, hampered by labor troubles and by disadvantageous tariffs in other countries, seemingly always against the Welsh tin manufacturer, is now in a very precarious condition. Normally this industry in Wales employed 30,000 persons and consumed upwards of 1,000,000 tons of steel annually.

Tin plate and terneplate produced in the United States, 1912–1925, in long tons[1]

Year	Tin plate	Terneplate	Total	Year	Tin plate	Terneplate	Total
1912	877,526	85,445	962,971	1919	1,074,624	76,723	1,151,347
1913	762,583	61,136	823,719	1920	1,374,979	70,566	1,445,545
1914	865,975	65,266	931,241	1921	747,911	46,363	794,274
1915	982,958	72,978	1,055,936	1922	1,208,772	79,123	1,287,895
1916	1,139,386	95,615	1,235,001	1923	1,414,404	92,458	1,506,862
1917	1,443,444	68,702	1,512,146	1924	1,328,228	90,426	1,418,654
1918	1,435,825	38,114	1,473,939	1925	1,544,007	113,788	1,657,795

[1] According to American Iron and Steel Institute. Special Statistical Bulletin No. 3. 1926

The largest manufacturer of tin plate in this country is the American Sheet & Tin Plate Co., which controls 264 mills out of a total of 567, and accounts for 48.5 per cent of the total domestic production.

Terneplates, steel plates coated with a mixture of tin and lead, are used chiefly in roofing and in the building of temporary houses, automobile parts, gasoline tanks, fireproof construction, etc. In 1925 the production was 113,788 long tons.

Upward of 60 per cent of the tin used in the manufacture of tin plate and terneplate is utilized in the manufacture of tin cans or tin containers. Some of the advantages of tin containers are as follows: (1) Nontoxic quality; (2) resistence to corrosion; (3) lightest practical container, thus lowering transportation charges; (4) pliable and not subject to breakage in transit; (5) cheapest and easiest container to fill; (6) keeps color of certain food from fading by exposure to light. The growth of the tin-can industry can be seen from the fact that at the close of the Civil War approximately 5,000,000 cans were utilized per annum. Sixty years later, in 1925, upward of 8,300,000,000 cans were manufactured.

Tin plate, terneplate, and taggers tin imported into the United States, 1924–25, by countries and by districts

	1924		1925	
	Short tons	Value	Short tons	Value
COUNTRY				
Belgium	212	$6,329		
Canada	38	8,906	16	$5,055
Cuba	(1)	1		
France	(1)	25		
Germany			1	173
Italy	1	273		
Netherlands			(1)	56
Sweden			(1)	5
United Kingdom (England)	909	142,125	409	102,088
Uruguay			1	247
	1,160	157,659	427	107,624
DISTRICT				
Buffalo			(1)	186
Chicago			2	397
Florida	(1)	1		
Los Angeles	3	747	12	3,485
Maine and New Hampshire	1	149	(1)	11
Massachusetts	11	2,509	25	6,092
Michigan	1	74		
New Orleans	370	36,364	48	6,316
New York	340	53,025	79	22,789
Ohio	7	1,633	24	6,415
Oregon	5	1,309	9	2,497
Philadelphia	76	18,529	109	27,906
Pittsburgh			(1)	22
Rhode Island	2	405		
St. Lawrence	37	8,625	25	6,374
San Francisco	211	12,012	17	4,721
Vermont	10	2,250	8	1,947
Washington	4	1,211	6	1,851
Wisconsin	82	18,816	63	16,615
	1,160	157,659	427	107,624

[1] Less than 1 ton.

Tin plate, terneplate, and taggers tin exported from the United States, 1924–25, by countries and by districts

COUNTRY	1924		1925	
	Short tons	Value	Short tons	Value
North America:				
Canada	25,219	$2,810,008	36,686	$3,925,952
Central America—				
Costa Rica	12	2,041	10	1,395
Guatemala	39	4,666	59	6,680
Honduras	(1)	15	1	97
Nicaragua	37	3,660	10	1,195
Panama	4	595	25	3,664
Salvador	73	9,262	41	5,087
Mexico	4,390	477,230	5,911	598,537
Newfoundland and Labrador	35	3,743	127	12,664
West Indies—				
British—				
Jamaica	9	1,588	68	6,671
Trinidad and Tobago	1	63	1	178
Other	(1)	59	(1)	14
Cuba	6,597	679,694	5,380	552,738
Dominican Republic	14	1,734	39	5,061
Dutch	583	61,293	712	72,781
Haiti	16	2,529	27	3,345
South America:				
Argentina	9,956	1,042,031	8,614	917,530
Bolivia	2	277	17	1,621
Brazil	3,023	310,399	4,536	448,956
Chile	3,674	390,027	6,407	647,295
Colombia	1,782	195,275	820	89,589
Ecuador	3	390	(1)	61
Paraguay			(1)	37
Peru	2,470	253,524	4,548	449,333
Uruguay	459	51,164	2,003	212,955
Venezuela	611	63,927	1,051	108,301
Europe:				
Azores and Madeira Islands			(1)	17
Belgium	823	81,160	170	14,730
Bulgaria	(1)	9	123	13,082
France			(1)	53
Germany			(1)	10
Greece	669	74,515	4,052	404,519
Italy	4,608	470,143	8,431	937,462
Malta, Gozo, and Cyprus Islands	21	2,000		
Netherlands	43	4,690	3	331
Norway			4	314
Portugal	348	37,262	540	54,178
Spain	5	494	72	7,591
Sweden			(1)	77
Turkey	805	83,404	1,823	177,664
United Kingdom—				
England	883	63,819	636	49,663
Scotland	27	3,264		
Asia:				
Ceylon	108	11,044	66	5,854
China	27,643	2,889,398	21,715	2,160,472
East Indies—				
British—				
India	11,214	1,207,136	10,608	1,093,605
Straits Settlements	425	44,577	1,665	177,723
Other			464	50,414
Dutch			(1)	22
Hongkong	7,106	664,328	1,934	201,942
Japan	60,465	6,769,371	43,429	4,356,033
Java and Madura	2,035	219,331	474	51,142
Philippine Islands	1,857	208,005	2,436	258,884
Turkey	269	27,816	430	37,451
Africa:				
British South	574	63,839	1,138	114,336
Egypt	1,378	139,060	3,384	340,056
Oceania:				
British—				
Australia	2	468	44	5,439
New Zealand			16	1,914
French			1	175
	180,317	19,430,327	180,751	18,586,890

[1] Less than 1 ton.

Tin plate, terneplate, and taggers tin exported from the United States, 1924–25, by countries and by districts—Continued

DISTRICT	1924		1925	
	Short tons	Value	Short tons	Value
Alaska	217	$24,360	(1)	$20
Arizona			128	13,085
Buffalo	15,511	1,705,783	18,029	1,883,969
Chicago	1,665	189,813	1,815	203,257
Dakota	2,055	249,062	3,669	443,082
Duluth and Superior	597	68,285	399	46,121
El Paso	6	864	9	1,503
Florida	76	8,572		
Hawaii			135	10,808
Los Angeles	6	1,447	(1)	38
Maine and New Hampshire	543	60,116	603	68,723
Maryland	51,850	5,691,255	59,735	6,011,374
Massachusetts	(1)	35	13	1,697
Michigan	925	98,062	3,536	335,704
Mobile	25	2,957	356	41,220
New Orleans	1,496	173,740	1,672	185,382
New York	96,581	10,201,690	78,871	8,044,072
Ohio	3,518	387,387	7,967	868,658
Philadelphia	2,769	298,018	357	39,952
Rochester	54	5,825	1	239
Sabine			23	1,270
St. Lawrence	87	8,533	366	40,821
San Antonio	367	42,280	575	64,999
San Francisco	687	58,463	690	75,875
South Carolina	864	106,710	966	93,245
Vermont	168	21,424	31	3,523
Washington	250	25,646	805	108,253
	180,317	19,430,327	180,751	18,586,890

[1] Less than 1 ton.

SOLDER

Solders in which tin is used are known as soft solders; they have a low fusion point and therefore are easily melted. They are not readily malleable. Solders vary in composition according to the intended use. The chief solders are alloys of tin and lead in variable proportions. For many years it was believed that no soft solder was as good as one made of 50 per cent tin and 50 per cent lead. Experience during the World War demonstrated that for almost all the uses of this class of solder a mixture of 40 per cent tin and 60 per cent lead answered every purpose.[19]

The major uses of solder are in the manufacture of food containers, automobile radiators, and electrical equipment. In the manufacture of automobile and airplane radiators very little solder containing more than 40 per cent of tin need be used, and often 35 per cent of tin, or less, is used successfully. In the canning industry a mixture of 37½ per cent tin and 62½ per cent lead is satisfactory. A possible disadvantage of using more lead than tin in a solder is the raising of the melting point. With the increase of tin the melting point falls until the eutectic proportion of 57.54 per cent tin to 42.46 per cent lead is reached. By the addition of bismuth the melting point is lowered still further and the alloy passes into the class of so-called fusible metals.

[19] Burgess, G. K., and Woodward, R. W., Conservation of Tin in Bearing Metals, Bronzes and Solders: U. S. Bureau of Standards Technol. Paper 109, 1919.

BABBITT AND OTHER BEARING METALS

Genuine babbitt metal contains 89 per cent tin and 11 per cent lead; when used as a bearing metal it contains 7.3 per cent antimony and 3.7 per cent copper. To make a hard bearing metal, the tin is reduced to 80 per cent, the antimony increased to 15 per cent, and the copper to 5 per cent.

BRONZE

The tin content of bronze and related alloys varies widely. For example, according to various formulas, gun metal contains 9 to 11

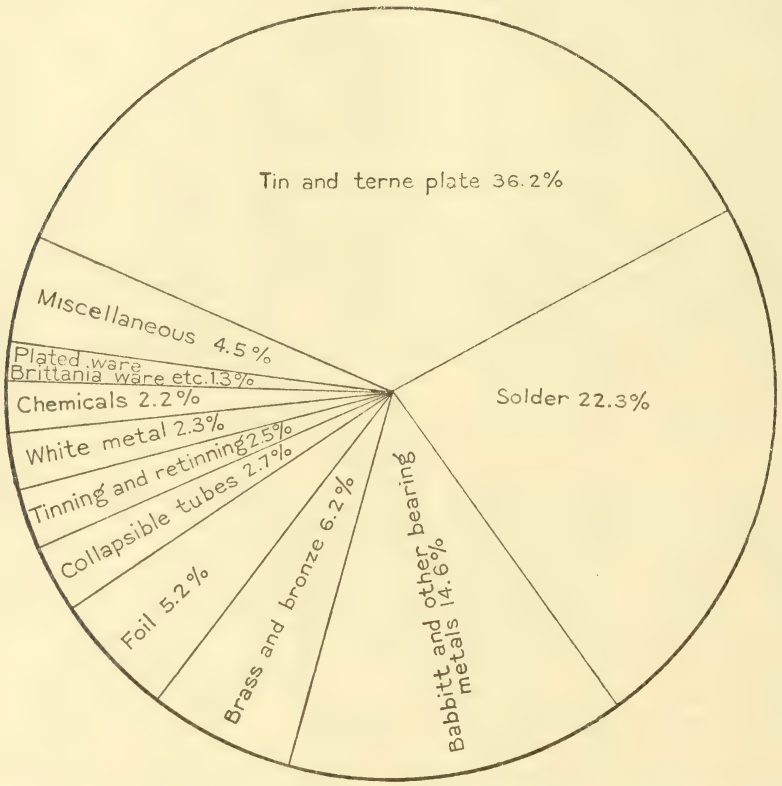

FIGURE 3.—Uses of tin in American industry. Compiled by War Industries Board subcommittee on pig tin, 1917

per cent tin and 89 to 91 per cent copper. One bell metal contains 25 per cent tin and 75 per cent copper; speculum metal 33 per cent tin and 67 per cent copper; phosphor-bronze 10 per cent tin, 89 per cent copper, and 1 per cent phosphorus.[20]

TIN FOIL AND OTHER USES

Tin may be largely alloyed with various metals without seriously impairing its suitability for foil. White metal, chemicals that are

[20] Davies, G. M., Tin Ores: Imperial Institute Monograph, p. 13, Table 7. Phosphor-bronze need not contain phosphorus, and is more or less a trade name.

used extensively in the dyeing and the ceramic industries, plated ware, and miscellaneous products account for the remainder of the tin utilized, as shown in Figure 3.

SUBSTITUTES

An entirely satisfactory substitute for tin is not known. A possible substitute for tinplating is chrome plating. Terneplate may be substituted for tin plate in many of its uses. This substitution lessens the quantity of tin used and accomplishes the same purpose. Cadmium may be introduced into solder. The effect is to increase slightly the melting point and to decrease the amount of tin, thus allowing an increase in the content of lead. Such substitution in all solder made would save 80 per cent of the tin normally used for this purpose. The supply of cadmium, however, is not large enough to permit substitution in all solder.

Lead may be substituted largely for tin in babbitt, and bearings so made, with the exception of those used for high-speed work, are better suited to the requirements. Foil and collapsible tubes may be made of aluminum, which is considered a satisfactory substitute for many but not all purposes.

WORLD SOURCES

PRODUCTION

World's production of tin, 1921–25, by countries, in long tons[1]

[Tin content of ore]

Country	1921	1922	1923	1924	1925
Australia	3,592	2,570	3,283	3,069	3,016
Belgian Congo [2]	631	898	974	994	2,000
Bolivia [2]	18,809	31,583	29,785	31,610	32,224
China [2]	6,321	9,102	8,031	7,090	8,788
Dutch East Indies	26,911	29,253	29,093	31,906	31,566
England (Cornwall)	679	370	1,021	1,986	[3] 2,500
India, British	1,362	1,530	1,405	1,375	1,323
Malay States:					
Federated [2]	34,490	35,286	37,649	44,043	48,425
Unfederated [2]	1,747	1,937	1,727	2,870	
Nigeria	5,067	5,123	5,860	6,162	6,186
Siam [4]	5,821	4,613	7,116	7,525	6,802
Union of South Africa	775	485	918	1,162	1,103
Other countries [3]	2,600	1,900	800	1,500	1,800
	108,805	124,650	127,662	141,292	145,733

[1] Compiled by L. M. Jones, of the Bureau of Mines.
[2] Exports.
[3] Estimated.
[4] Year ended March 31 of year following that stated.

It has been estimated that on an average upward of 10,000 tons of tin are always in transit to supply the demands of the United States. The so-called visible supply of tin includes stocks in warehouses, tin at smelters, and tin afloat or in transit. In 1925 the visible supply was 23,374 tons and on January 1, 1926, the visible supply was 16,709 tons, or a decrease of 6,665 tons for the year.

Figure 4 shows graphically the world's production of tin in 1925.

FOREIGN RESOURCES

Federated Malay States.—The Malayan deposits consist almost entirely of alluvial and residual placers, which account for 94 per

cent of the total output. Of the 6 per cent remaining, the Pahang Consolidated Co. (Ltd.) produces 96 per cent from lode mining.

The placers are on the west side of the peninsula; they cover large areas, are virtually continuous for some 200 miles, and are possibly 20 miles wide. Prior to 1912 the total production except a small percentage from the Pahang lode mining was won from placers. Most of the earlier work was done by the Chinese. Of the placer deposits the richest are of the residual type and are known as contact mines. The best of these are now owned by Europeans, but the bulk of the production comes from Chinese-owned workings. Dredging, which began in 1912, has increased until now it accounts for upward of 20 per cent of the total production. In 1925 there were 44 bucket dredges and 8 suction cutter dredges at work. Virtually all the areas now being dredged were worked in the early days by the Chinese. The ground has been carefully prospected and the richest spots mined. The ground now available for dredging consists of old Chinese tailings, too low to work by hand methods. It is thought that areas set aside for agricultural purposes contain valuable placers at present prices of tin.

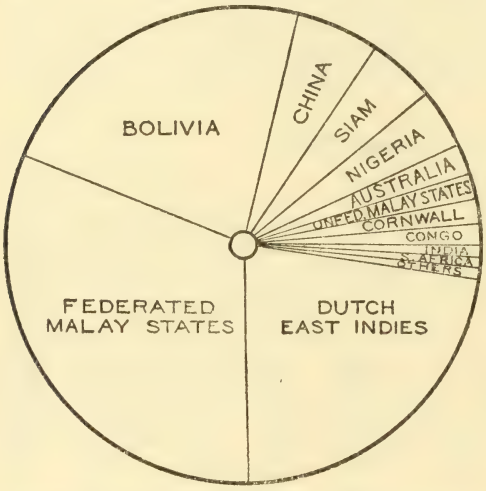

FIGURE 4.—World's production of tin in 1925, apportioned by countries of origin

The various methods of mining contribute to the output in approximately the following proportions: Gravel pumping, 27 per cent; dredging, 20 per cent; hydraulicking, 11 per cent; shafting, 8 per cent; open-cast mining, 4 per cent; ground sluicing, 18 per cent; fossicking, 6 per cent; and lode mining, 6 per cent. These methods may be grouped as (1) ground sluicing, including gravel pump, hand method, hydraulicking, etc., which are confined to the richest parts of the placer; (2) dredging ground; and (3) lode mining. In 1925 these three classes contributed to the total output as follows: Ground sluicing, 33,984 long tons; dredging, 9,185 tons; lode mining, 2,756 tons. In 1914 ground sluicing produced over 45,000 tons out of a total production of 49,000 tons. The change in proportions is due to the exhaustion of deposits suitable for ground sluicing, in spite of the ever-increasing price of tin.

Areas amenable to dredging are becoming more and more limited and there is little hope for much expansion of output by dredges under present practice. The difficulties met in the early days of dredging in handling the alluvial and residual clay have been largely overcome by the introduction of jigs. The synchronizing of the digging end of the dredge with the sluicing end has gone on and the gap between the two has been greatly narrowed. The hope that the cutter type

of dredge, from its lower cost of construction, would largely replace bucket dredges in new installations has not materialized.

In the third class, lode mining, there has been little progress. The production of the Pahang Consolidated Co. (Ltd.) has remained relatively constant. Expansion can only be looked for with increase in price of tin. There is little hope that this class of mining can equal the per annum production in the past of class 1 type. Apparently production on the scale that prevailed in 1925 can not be long maintained, as the ground amenable to the two classes of mining which contribute the major part of the output is becoming rapidly exhausted. The price of tin has been high enough to insure returns on investments since 1921. Of the European-owned mines 98 per cent are on a substantial dividend-paying basis.

The increased production in 1924 and 1925 may be attributed in the main to the use of the gravel pump. In 1924 there were 300 of these pumps in use, whereas in 1925 there were 550. The royalties charged on classifiers and jigs have retarded the use of these machines, although they are recognized to be much more efficient than sluice boxes and cut down the percentage of loss nearly 50 per cent. The admitted losses in sluice boxes are between 10 and 15 per cent. Various engineers have estimated that tin dredging can not maintain its present production for more than 20 years.

In 1925, the Public Works Department modified greatly the requirements as to control of tailings. The concessions permitted the unlimited discharge of matter smaller than 150 (Institute of Mining and Metallurgy standard) mesh screen, and the larger material was limited to not more than 20 grains per gallon of matter larger than 80 mesh or nothing larger than 60 mesh. One of the main features of the year was the development of some of the deposits in the Klang Valley, indicating that the area may become an important source of tin at the expense of some rubber land.

As to the future, it seems probable that after the next two or three years the total production will gradually decrease. However, large areas of low-grade ground can be brought into operation when prices are high enough. The art of dredging is in its infancy. The adaptation of the gold-mining bucket dredge to tin mining has not been completely successful. As tin becomes scarcer the present tailing losses will undoubtedly be curtailed. Lode mining will contribute more and more to the output of Malay as prices warrant development. In other words, the day seems distant when Malay will no longer be one of the important tin-producing countries.[21]

Stimulation of tin production by removing the restrictions on the pollution of streams and by paying a bonus, in the shape of decreased direct taxation, to the discoverers of new property has been considered. It has been calculated that of the tin concentrates containing 72 per cent tin the miner receives 60 per cent of the world's price. When tin is selling above £200 sterling a ton there is a duty of 13.8 per cent payable to the Government, which, in view of the smelting and transportation charges, seems excessive. There is

[21] Federated Malay States, Report of the Administration of the Mines Department and on Mining Industry: Federated Malay States Yearbook; Jones, W. R., Tin Fields of the World, 1925.

little doubt that, without a rise in the world's price, decreasing the present tax and adopting a more liberal policy in reference to discovery would greatly increase tin production in the Federated Malay States.

Unfederated Malay States.—The tin deposits are similar to those in the Federated Malay States but are of smaller extent. The properties are worked on a small scale by Malay and Chinese miners. Mining methods are more backward than those in vogue in the Federated Malay States.

Bolivia.—Tin mining in Bolivia is of comparatively recent origin, although the tin deposits have been known for several hundred years. Owing to the lack of fuel, little block or pig tin is produced in the country, and practically the entire output is exported in the form of barilla (concentrates) running from 60 to 70 per cent metallic tin. At present little if any tin ore is obtained from placers, but this class of mining is being developed by American capital, which entered the field near Potosi in 1925. The output at the present time comes from lode mining. The largest tin lode mines known are situated in Bolivia.[22]

In 1925 the production contained 32,224 long tons of metallic tin. Of this amount, the Llallagua and la Salvadora of the Patiño Co. contributed approximately 30 per cent. The mining laws of Bolivia are liberal. There are no restrictions, legislative or administrative, placed on aliens that are not also placed on nationals in operating mineral properties or distributing mineral products. There are also no restrictions on the sale of mining rights to aliens. No development of mineral resources or distribution of mineral products is affected directly by the Government, nor does the Government finance private companies engaged in distributing mineral products. Sixty per cent of the public revenue of Bolivia is obtained by taxation of the tin-mining industry.

Of all the tin-producing countries that are now known to the world, Bolivia is thought to be the only one that is capable of increasing its output materially. The mineralized area containing tin is large and development work has been confined to the accessible localities. Lack of shipping facilities renders only such areas commercially available as are tributary to present lines of transportation. The output of many mines is limited to extremely high-grade ore in order to meet transportation charges. The llama is the only beast of burden used; its average load is 70 to 90 pounds. Ore carrying 40 per cent or more cassiterite has been commercially transported 250 miles. Little is known as to the reserves in the deposits far from transportation lines. Indeed, the only knowledge of distant mines or prospects is gained from occasional shipments of high-grade ore. From the character of the deposits in the accessible localities it seems fair to assume that there are relatively large bodies of low-grade ore which will become productive when transportation facilities are improved. Because of the topography of the tin-bearing areas the development of adequate transportation will probably be very gradual.

---

[22] Bancroft, H., "The tin situation in Bolivia": Am. Inst. Min. Eng., 1913, Bull. 81, p. 2311. Lindgren, Waldemar, "The tin deposits of Chacaltaya, Bolivia": Econ. Geol., vol. 19, 1924, pp. 223–228. Ivey, J. H., "Some Bolivian tin mines": Min. Mag., October, 1923, pp. 220–223.

In few mining fields of the world are the conditions which exist in Bolivia duplicated. At the Patiño property the equipment is of the latest type and methods of mining and ore dressing are modern in every sense. There is, however, even at this property a chance to curtail tailing losses. In the same district mining and concentration are being carried on by others by the most primitive methods. The field for improvement in technology is large. Production can be greatly augmented by improved methods of mining at the properties now more accessible to transportation. It seems probable that the peak of production has not been reached and that tin mining will flourish for many years. However, if the present tendency to increase taxes is maintained, the production of tin will, temporarily at least, be curtailed.

Dutch East Indies.—The tin deposits of the Dutch East Indies are in the islands of Banka, Billiton, and Singkep. The island of Banka produces about two-thirds of the tin shipped from the Dutch East Indies. Geologically the deposits form the southern extremity of the mineralized area that extends through the Malayan Peninsula. The deposits are owned by the Dutch East Indies Government. In 1924 there were 75 major and 235 minor operations on the island. The ore reserves of the island of Banka have been officially estimated at 220,000 tons of proven tin oxide, SnO_2, and 105,000 tons of probable SnO_2. Tin mining on the island of Billiton is conducted by a private corporation that has a concession from the Dutch Government and pays the Government 62.5 per cent of all profits. The methods of mining are modern. The Singkep Mining Co., operating on Singkep Island, is also under the control of the Dutch East Indies Government. The Billiton and Singkep areas contain considerable reserves, but the total reserves are probably only a fraction of those of Banka. At present some tin in the Dutch East Indies is derived from lode deposits, but owing to their small size and the sporadic occurrence of the tin they give little hope that they can maintain the production of the country when the placers are exhausted.

The Dutch Government has for many years maintained a relatively constant yearly output. Part of the concentrates shipped from Billiton and Singkep is treated by the Straits Trading Co. at Singapore. During 1925 there was much agitation for the establishment of a central smelting plant at Batavia.[23]

China.—Although China is the fourth largest producer of tin in the world, and the third largest source of tin that is not directly controlled by Great Britain, the country exports most of the pig-tin output and imports some 20,000 to 25,000 tons of tin plate annually, upward of 68 per cent of which is supplied by the United States. Ninety-eight per cent of the exports of tin are derived from the Mengtze district of Yunnan. The industry is entirely in the hands of the Chinese. The ores are reduced in small furnaces and the product averages 90 to 93 per cent metallic tin. Of late this material has been further refined and a relatively standard grade of tin is now produced. In the Mengtze district are the Kotchiu mines, which employ some 30,000 men and utilize native methods of mining.

[23] Netherlands East Indies, Subdept. of Industry and Commerce, Buitenzorg, Java, Yearbook: Jaarstatistiek van den In-, Uit-, en Doorvoer. Jaarboek van den Mijnwesen Ned. Oost Indie, Jaarcijfers-Kolonien.

Until a few years ago it was thought that the major part of the output of China was derived from low-grade detrital deposits, but recent investigations have shown that the larger part of the present output is from lode mines. The Kotchiu tin belt extends about 20 miles in a northerly direction and it is 3 to 4 miles wide. The country rock is a noncherty fossiliferous limestone, associated with shales and some beds of impure coal. The mountains are largely composed of granite which has intruded the sedimentary beds, and many of the tin deposits lie along the contact between the sedimentary beds and the granite. The surface materials have been largely worked, but possibly considerable quantities of tin may yet be recovered from unworked areas. The placers are "residual," being the decayed outcrops of the lodes.

By far the larger part of the output comes from the underground mining of lodes. The principal mines are at an elevation of about 800 feet above sea level. In some of them mining has been carried to a vertical depth between 1,000 and 1,500 feet. Most of the mines are opened by inclines with grades between 15 and 25°. Although the ore bodies are large, the ore is taken out by drifts not more than 4 feet high and little stoping is done. No provision is made for artificial ventilation, but because of the character of the ground the natural ventilation in most places is fairly good.

With the exception of the Malaga and Kuschami, which are owned and operated by the Kotchiu Tin Trading Co. (a Government concern), there is no individual ownership of mines or demarcation of claims. Discovery and possession constitute the only title. When adverse interests meet, the right to possession is settled by force. There are no taxes of any kind on mining properties. The taxes collected by the local authority are on the output. The customs are high in comparison with taxes in other countries. The Government does not assist the tin industry in the same way as, for instance, the British Government does its industry. Nothing is done in the way of road building, policing, or providing water and other essentials necessary for working the mines economically. The export duties on tin and the local taxes referred to supply the major portion of the money utilized by the Yunnan Government. The export of tin is the main factor in fixing foreign exchange in Yunnan, and so influences the price of every item bought or sold.

Siam.—The tin deposits of Siam are a part of the tin-bearing belt that stretches from Singkep through the Malay Peninsula into Burma, and are geologically connected with the granites of the main range which forms the backbone of the peninsula. As much of the country is inaccessible through lack of transportation, only a small part has been explored. Except for the operation of British, Dutch, and American companies, all the mining is in the hands of the Chinese. In the past the smelting was done locally by Chinese methods. At present tin is shipped to the Straits Trading Co. for refining and marketing.

Mining methods are similar to those in the Malay States. Forty per cent of the output comes from dredging in Tongkah Harbor. The balance is obtained by various methods of placer mining. Practically no ore is produced from lode mining. It is believed that production has not reached a maximum and will continue for many

years. Siam seems to have more lode deposits than any section now known in the Malayan Peninsula. It is reported that in the district of Nakon Sritarmarat there are large numbers of lodes that are wide enough and carry enough tin to be of commercial grade. This area was intensively mined for tungsten. As the tin values seem to be persistent and the veins seem to show no diminution of either width or value in depth, the area may produce a considerable tonnage of tin over a long period. Siam offers good possibilities in tin mining. Dredging has been very successful. The dredging areas are large; operating conditions are not adverse and there are large areas of unexplored territory. The annual production is increasing. The tin industry is not directly controlled by British interests, although the major portion of the output is smelted by them.

Nigeria.—Tin mining has long been a native industry in Nigeria. The first production for export, 458 tons of cassiterite, was made in 1909. In 1924 the production was equivalent to 6,162 long tons of metal, and in 1925 to 6,186 tons. The center of activity is the Province of Bauchi. The ore occurs wholly in alluvial deposits.[24] The chief factor that limits Nigerian production is the small supply of water during most of the year; hence it is doubtful if the present output can be materially increased. From the various estimates that have been made of the reserve, it is judged that with tin at present prices or better, the present annual output can be continued for many years.

Australia.—Commercial deposits of tin are found in New South Wales, Queensland, Victoria, Western Australia, Tasmania, and the Northern Territory. Tin mining began in 1872 in New South Wales, Queensland, and Tasmania. The cassiterite is usually associated with granite. Placers are both residual and alluvial, and by far the major portion of the tin obtained is derived from them. Only a few lode mines are now worked, though many have been worked in the past. The best known is the Mount Bischoff mine, in northern Tasmania. This mine has practically stopped producing, but it has paid more than £2,000,000 in dividends. The known residual deposits are approaching exhaustion; no large lode mines are known and little interest is taken in lode mining. The output is waning.

Burma (*India*).—The occurrence of tin in British Burma is similar to that in other parts of the Malay Peninsula. Mining, chiefly the sluicing and hydraulicking of alluvial deposits, is carried on by Chinese and Siamese. Until recently southern Burma was the central source, but since 1917 the Southern Shan States have become the main producers. The tin deposits of Burma lie between the tin fields of the Malay Peninsula and those of Yunnan in China. As the country has not been intensively prospected, it seems likely that the present rate of production can be maintained for many years.[25]

England.—Cornwall was for centuries the most important tin-mining area in the world. The industry dates back to prehistoric times and is at least 4,000 years old. In 1890 the output was 9,602 tons, but in 1922 it was only 370 long tons. In 1922 through the trade facilities act several of the old mines were refinanced and the

[24] Colony and Protectorate of Nigeria, Lagos: Blue book; Rumbold, W. R., and Johnson R. H., "The Nigerian tin deposits": Min. Mag., vol. 33, August, 1925, pp. 73–83.

[25] Brown, J. C., "The cassiterite deposits of Tavoy": Rec. Geol. Survey India, 1918, vol 49, p. 23.

production for 1925 has been estimated to be more than 2,000 tons. At present tin mining in Cornwall is recovering steadily but slowly from the adverse conditions that afflicted it after the World War. It seems scarcely possible that production will ever again equal that of 1890, but Cornwall will continue to produce a small quantity of tin for many years.

Rhodesia.—Cassiterite has been found in pegmatite dikes, but the occurrences are very spotty. No alluvial deposits have been discovered. A little work has been done on the lodes and a small amount of tin produced. High costs make profitable mining difficult. Little is known as to the reserves.[26]

Union of South Africa.—The Waterberg area, in western Transvaal, and Swaziland are the chief tin-mining areas in South Africa. The output of these districts at present is less than 200 tons per annum. Little is known as to the reserves.[27]

Cape Province.—Tin ore has been found in Cape Province and Natal, but the properties developed so far are of little importance.[28]

Portuguese East Africa.—According to the Imperial Institute, small amounts of cassiterite have been found in the territory of the Cia. de Mozambique, but no production has been made.

South West Africa.—A tin-bearing belt extends from Otjimboyo, on the Khan River, northeast of Karabib, through the Erongo Mountains in a northwesterly direction to Uis. Tin was first discovered in 1910 at Ameib; discoveries in other localities followed shortly. Cassiterite occurs in pegmatite and is genetically connected with older granites. Work on the veins has been discouraging, as the deposits seem to be very small. As a tin-mining field this country is not promising.[29]

Belgian Congo.—Mining of tin in the Belgian Congo is recent. There seems to be a potential tin belt that strikes southwestward for about 250 miles, and the Union Minière du Haut-Katanga controls 175 miles along the southern part of the belt. The extension northward is owned by the Thyf-Jadot group, and farther north along the strike are the holdings of the Muika group. The production at present is about 60 tons per month. As the area has not been thoroughly explored, little is known as to the possibility of increased production in the future.[30]

Indo-China.—A small annual output of ore is smelted locally. Most of the tin comes from the neighborhood of Kao Bang in north Tonkin, where it is associated with tungsten ores in eluvial and alluvial deposits derived from veins of quartz in granite containing cassiterite. The yearly production is about 300 tons of metallic tin. The most important undertaking is the Nam Paten tin mines in the Laotin Basin. It is estimated that enough ore is in sight to maintain a regular production for at least 50 years. One of the drawbacks of this district is its inaccessibility.

Attention is now being devoted to tin deposits in the Laos district of Indo-China, which are situated in the valley of the Nam

---

[26] Davies, G. M., Tin Ores: Imperial Institute Monograph, 1919, p. 50.
[27] Davies, G. M., Work cited, p. 50.
[28] Davies, G. M., Work cited, p. 52.
[29] Davies, G. M., Tin Ores: Imperial Institute Monograph, 1919. Davies, G. M., and Calvert, A. F., The German African Empire, pp. 91–93.
[30] Ball, S. H., and Shaler, M. K., "Economic geology of the Belgian Congo": Econ. Geol., vol. 9, p. 640.

Paten north of those exploited at Ban-Ta-Coua by the Société des Études et des Exploitations Minières de l' Indo-Chine. The chief deposit, Bo-Neng, is now being opened up. The tin formation is more than 1 kilometer in length, is several hundred meters wide, and in places more than 20 meters thick. Assays have given as much as 20 per cent of tin, and it is estimated that ore carrying some hundreds of tons of metallic tin is in sight. Other deposits on the west side of Mont Pou-Phoune also seem to be important and are to be investigated during the course of the year.[31]

Czechoslovakia and Germany.—The tin-bearing lodes of Bohemia and Saxony occur in granite. They are distributed throughout the Erzgebirge in Bohemia, Zinnwald on the frontier between Saxony and Bohemia, and at Altenberg and several places near Glashütte and Dipoldiswalde. Farther west tin is found at Schlackenwald, Platten, Johanngeorgenstadt, and at Eibenstock in Saxony. Between these areas are isolated occurrences. The deposits have been known and worked for centuries. The present deposits in Saxony contain only about 0.3 per cent metallic tin, and are virtually exhausted. In 1458 the production was more than 300 tons per annum. In 1913, 11 tons of concentrates were produced and it is probable that during the World War some tin was obtained from the mines as they were aggressively worked.[32]

France.—Tin deposits[33] are found in Brittany in the granite near Villeder, southwest of Ploermel, in Morbihan. Production is small and erratic. The last authentic figures of production are those for 1909; in that year 22 tons of metallic tin were produced.

Portugal.—In northeastern Portugal tin is found in many localities. Most of the production comes from lode mines in granite and schists. In the Gaia Valley near Belmonte and Alluvium, properties are being worked by bucket dredges.[34]

Spain.—In the northern part of Spain a continuation of the mineralized belt of northeastern Portugal contains tin deposits. In this belt are the lodes of Penuta, Romilo, and Pontevedra. The output is somewhat less than 90 metric tons per annum. The ore bodies are small and incapable of large production. The tin-bearing gravels of the Iberian Peninsula were worked to exhaustion by the Phoenicians and Romans.[35]

Russia.—On the Onon River in Trans-Baikalia are lodes and placers that have never been particularly productive.[36]

Italy.—In Tuscany, at Campiglia Marittima, iron and tin deposits were mined in early times and were rediscovered in 1871. Masses of cassiterite occur in veins of limonite cutting limestone and shales. They are of academic interest in that they are the only examples in Europe of tin deposits of Tertiary age, possibly the same age as the great deposits of Bolivia.[37] The present production is less than 200 tons per annum.

Japan.—The tin deposits of Japan are of slight importance. The chief mine is that of Taniyama, in the Province of Satsuma. Quartz

---

[31] American Metal Market, Apr. 27, 1926, p. 4.
[32] Davies, G. M., Work cited, pp. 75–76.
[33] Davies, G. M., Work cited, pp. 76–78.
[34] Mining Magazine (London), "Tin and tungsten in Portugal": Vol. 14, 1916, p. 19.
[35] Preiswerk, H., "Ueber einige Zinnerzlagerstätten in Spanien und Portugal": Zeit. prakt. Geol., 1913, Bd. 21, p. 74.
[36] Davies, G. M., Work cited, pp. 82–84.
[37] Fawns, Sidney, Tin Deposits of the World, 3d ed., London, 1912, p. 180.

veins which carry cassiterite, with varying quantities of galena and pyrite, are found in Tertiary tuff. The veins have been worked almost continuously since 1655. The output has been 400 to 450 tons per annum for several years. There are alluvial deposits at Nayegi, in Mino. The cassiterite is found close to the granite bedrock and is associated with tungsten.[38]

Mexico.—Deposits of tin are widely distributed in Mexico; they occur in the States of Durango, Jalisco, Guanajuato, San Luis Potosi, Aguas Calientes, Zacatecas, and Coahuila. The lodes are in volcanic rocks of Tertiary age. Alluvial deposits have been found in Tepezala in Aguas Calientes; Sain Alto, Zacatecas; and other places. Mining has been practically continuous from the Aztec period to date, but the annual output is estimated to be less than 50 tons metallic tin. The veins are small and the occurrence of the cassiterite is spotty. The ores are concentrated by washing and panning, and the concentrates, which usually carry 45 to 55 per cent tin, are smelted in small blast furnaces. The product, containing 90 to 96 per cent tin, finds a ready local market. There are no known areas containing reserves of any magnitude.[39]

Argentina.—Occurrences of tin have been reported from time to time in northwestern Argentina, in the Provinces of Jujuy, Los Andes, and Catamarca. There are no producing mines, possibly because of the inaccessibility of the region. It seems probable that the stanniferous mineralization extending southward from Lake Titicaca in Bolivia may be found in northern Argentina as the geological conditions are similar.[40]

PRICES

The average price of Straits tin in New York in 1925 was 57.9 cents per pound, as compared with 50.2 cents per pound in 1924.

Average monthly prices, in cents per pound, of Straits tin in New York in 1925 [41]

January	58.23	May	54.67	September	58.27
February	57.08	June	55.92	October	62.23
March	53.72	July	58.08	November	63.27
April	52.21	August	58.18	December	62.95

The average price for the year in London was £261 1s. 8d. a ton of 2,240 pounds; the lowest monthly average price was £237 2s. 8d., and the highest was £285 1s. 1d. The average price of tin, decade by decade, has steadily risen; and from what is known of the reserves it seems safe to predict that in the next 20 years the average price will be decidedly higher than that during the past 20 years. The spread between demand and supply is never large. The demand for tin is always on the heels of production and lack of production curtails more extensive use of the metal.

In the past prices have been fixed largely by speculators acting on the London market. The fluctuations in price have depended largely on these speculations and the opinions of buyers and sellers as to general prosperity. Because of these conditions, during the years since 1921 the producer has given little attention to the spread

[38] Davies, G. M., Work cited, pp. 89–90.
[39] Master, G. C., "Tin mining in Mexico": Min. Mag., vol. 9, 1913, p. 199.
[40] Echo des Mines [Tin in Argentina], Dec. 30, 1907.
[41] Metal Statistics, 1926, p. 337.

between cost of production and selling price. His concern has been the amount of profit rather than any possible loss. Except during times of duress the price of tin has never been fixed and it has not been based upon cost of production, plus whatever might be considered as reasonable profit, but upon what the market would bear. Every possible advantage has been taken of the needs of the consumer. The various customs now in vogue in the marketing of tin peculiarly lend themselves to speculation.

BRITISH CONTROL

Upward of 50 per cent of the world's output is directly controlled by British interests, both governmental and private. A possible addition of 20 per cent is indirectly controlled by the British smelting monopoly. The only major sources uncontrolled are those of the Dutch East Indies, Siam, and China, and of these a large part of the Dutch East Indies tin is now smelted by the Straits Trading Co. (British), which handles part of the Chinese output and resmelts and sells practically all of the Siam output. More than 98 per cent of the Bolivian output is now smelted in Great Britain and Germany and is controlled by a British-American-Bolivian company. Since the World War a considerable quantity of tin is purchased direct from the Straits Trading Co. at Singapore. The company bases daily prices upon the London and New York prices as well as the needs of the purchaser. Daily bids are submitted by agents of the various consuming companies and the Straits Trading Co. may or may not have tin to sell at the price submitted. In other words, the method of sale is but a variation of the old method of auctioneering.

With the exception of the Dutch East Indies, no evidence can be found which points to governmental regulations to restrict output. Output or production is and has been limited by physical conditions—for example, the utilization and appropriation of all water available, or, as in Bolivia, lack of transportation. In exercising a control over their annual output the Dutch seem to regard physical conditions, such as available water, and possibly the fact that they have found that the present annual production gives an economic advantage. Their position is extremely fortunate. Great Britain sets the price and for many years this price has been far in excess of the cost of production in the Dutch East Indies.

SMELTING

The annual capacity of the world's tin smelters is approximately 175,000 tons. The Dutch East Indies smelt slightly in excess of 50 per cent of their output; the balance goes to the Straits Settlements for refining. The major part of China's output is now sold direct by the Chinese. Less than 3 per cent of Bolivia's output is smelted in Bolivia and Chile. A small percentage of the output of Siam is smelted locally; the balance goes to the Straits Settlements. The National Lead Co. of New York is associated with Williams-Harvey & Co., of Great Britain, and the Patiño interests of Bolivia in smelters situated in Great Britain and Germany. This association handles upward of 70 per cent of Bolivia's output. With the excep-

tions mentioned, the balance of the world's production of tin is smelted by British interests.

A new smelting plant is being constructed near Batavia, Dutch East Indies. Its capacity is slightly in excess of the total production of tin concentrates of the Dutch East Indies.

EXPORT TARIFFS OF BRITISH EMPIRE

The duty imposed on tin ore to protect and maintain the smelting industry in Malaya is 73 per cent of the duty on metallic tin, with an additional duty of $30 Straits (1 Straits dollar=2s. 4d.) per picul on all ore exported to be smelted outside the British Empire. This is equivalent to about $375 (United States) per long ton. Sir Frank Swettenham, resident general, Federated Malay States, is credited with the following statement at the time the act was promulgated:

> An American attempt to transfer this tin smelting to American soil and so obtain, in time, complete control of Malay tin products was frustrated by imposing a prohibitive duty on exportation of tin ore and giving an equivalent rebate on all ore smelted in the Straits Colony.

Smelting in Federated Malay States is now handled virtually in its entirety by two companies, the Straits Trading Co. and the Eastern Smelting Co.

In Nigeria an export duty of 50 per cent ad valorem is imposed on tin ore and concentrates to other than British ports.

UNITED STATES TARIFFS

In the tariff act of 1922 (H. R. 7456) is the following paragraph:

> Par. 1684. Tin ore or cassiterite and black oxide of tin: *Provided*, That there shall be imposed and paid upon cassiterite, or black oxide of tin, a duty of 4 cents per pound, and upon bar, block, pig tin and grain or granulated, a duty of 6 cents per pound when it is made to appear to the satisfaction of the President of the United States that the mines of the United States are producing one thousand five hundred tons of cassiterite and bar, block, and pig tin per year. The President shall make known this fact by proclamation, and thereafter said duties shall go into effect.

IRON ORE, PIG IRON, AND STEEL

By Hubert W. Davis [1]

GENERAL REVIEW

In 1925 the production and the shipments of iron ore increased respectively 14 and 23 per cent as compared with 1924. The production ranked about with that of 1919, and was 116 per cent of the average for the preceding 5 years and 102 per cent of the average for the preceding 10 years. The output of pig iron increased 17 per cent as compared with 1924 and was about 120 per cent of the average of the preceding 5 years and about 111 per cent of the average for the preceding 10 years. This output was about equal to that of 1920, and is the sixth largest on record.

The average value per ton for iron ore at the mines decreased 13 per cent and that of pig iron at the blast furnaces 6 per cent. The quoted prices of ferromanganese were higher but those of spiegeleisen and steel were considerably lower. In operating conditions and resulting production in the iron and steel industry the year 1925 was highly satisfactory. Earnings showed some improvement over those for 1924.

In July, 1924, the Federal Trade Commission ordered the discontinuance of the system of basing steel prices on the price at the Pittsburgh mills plus the freight to destination, but the ultimate effects of this order have not become established; as yet the relative positions of the chief producing districts have not changed much.

Labor conditions seem to have been fairly satisfactory at both mines and mills. A reduction of 10 to 15 per cent in wages at a few mines in the Lake Superior district went into effect during 1925 and caused strikes at some of the mines, but it affected only a small proportion of the total men employed. Transportation conditions were satisfactory, and there was an almost uninterrupted flow of ore from mines to furnaces.

The railroads were the leading buyers of steel in 1925, although the quantity was lower proportionately than in 1924. The automobile industry was a good customer, buying more than in 1924, as did also manufacturers of food containers and agricultural implements.

The total domestic output of pig iron required about 72 per cent of the theoretical annual capacity, according to figures of the American Iron and Steel Institute, but this capacity was not utilized steadily. At the beginning of 1925 there were only 235 furnaces in blast; on June 30 there were 198, and at the end of the year there were 238. The production of steel ingots is considered to have been

[1] Figures of imports and exports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

about 79 per cent of the theoretical capacity, having ranged from about 66 per cent of the capacity in July to 90 per cent in March. The output of pig iron in the United States represented nearly one-half of the world's production and was about equal to that of all the producing countries of Europe combined. The production of these European countries increased about 9 per cent, compared with an increase of 17 per cent in the United States.

Iron-ore mining in the Lake Superior district had a busy year in 1925 because of larger demand, although ore prices were cut about 50 cents a ton. Eastern furnaces took about 500,000 tons of Lake ore; they bought chiefly foreign ores that they could get more cheaply. The shipments of domestic and foreign iron ore and manganiferous iron ore to blast furnaces exceeded the consumption of these ores by about 2,500,000 tons in 1925. From the shippers' standpoint the price received for the ore in 1925 was unsatisfactory, for the price was lower and there was no material reduction in such mining charges as labor, supplies, and taxes. In consequence, many mines worked at a loss and few showed a profit. The season of 1925 ended with stockpiles smaller than at the close of 1924. The total decrease in stocks in the Lake Superior district amounted to 15 per cent.

IRON ORE

QUANTITIES MINED AND SHIPPED IN 1925

In the accompanying table the quantities of iron ore shown include beneficiated ore; that is, ore treated in any way, rather than the crude ore. The figures on both production and shipments include the iron ore used for fluxing other metallic ores at smelters in the Western States, but the shipments do not include the iron ore sold for the manufacture of paint, which amounted to 26,521 gross tons in 1925, valued at $140,986, or $5.32 a ton, compared with 20,630 tons in 1924, valued at $103,626, or $5.02 a ton. The output of manganiferous iron ore (including ore used for flux), which contained 5 per cent or more of manganese, amounted to 1,448,054 gross tons, valued at $3,752,486, as compared with 898,468 tons, valued at $2,739,254, in 1924. In Arkansas one producer shipped a small quantity of loadstone, which is not included in the tabulated statistics of iron ore. Neither do the statistics include iron sinter recovered from copper sulphide ore, 5,290 tons of which, carrying in excess of 64 per cent of iron, was made in Tennessee in 1925.

In both 1924 and 1925 iron ore was mined in 20 States. All the iron ore produced in California and Montana and a small quantity of that produced in New Jersey and Utah was used for flux; a small quantity of ore from New Jersey and Pennsylvania was used for purifying gas; all of the output from Washington was used in the manufacture of ferromagnesite; the ore produced in the remaining States was mainly for use in blast furnaces; Michigan, Minnesota, New Jersey, New York, Pennsylvania, Tennessee, and Wisconsin produced small quantities that were used for paint. The rank of the three States producing the largest quantity of iron ore—Minnesota, Michigan, and Alabama—remained virtually unchanged. Minnesota, which has furnished nearly 61 per cent of the total for the United States in the last five years, is producing more iron ore than all the rest of the States together.

The ores of iron are classed under the four heads—hematite, brown ore, magnetite, and carbonate.[2]

Iron ore mined in the United States, 1924–25, by States and varieties, in gross tons, with percentage of increase or decrease in 1925

[Exclusive of ore containing 5 per cent or more of manganese]

State	Hematite	Brown ore	Magnetite	Carbonate	Total	Percentage of increase or decrease in 1925
1924						
Alabama	6,398,119	595,494			6,993,613	
California			435		435	
Colorado		4,702			4,702	
Georgia	38,217	74,822			113,039	
Michigan	12,350,755				12,350,755	
Minnesota	31,857,132		44,953		31,902,085	
Missouri	72,425	7,422			79,847	
Montana	(1)	[1] 3,913			3,913	
New Jersey			65,197		65,197	
New Mexico			189,371		189,371	
New York	12,966		242,866		255,832	
North Carolina		12,525			12,525	
Ohio				244	244	
Pennsylvania		1,014	803,189	3,005	807,208	
Tennessee	171,254	8,599			179,853	
Utah	[1] 148,278	[1] 15,876			164,154	
Virginia		89,792			89,792	
Washington			1,700		1,700	
Wisconsin	690,058				690,058	
Wyoming	363,096				363,096	
	[1] 52,102,300	[1] 814,159	1,347,711	3,249	54,267,419	
1925						
Alabama	6,453,875	639,375			7,093,250	+1
California			352		352	−19
Colorado		8,642			8,642	+84
Georgia	11,618	67,217			78,835	−30
Michigan	14,490,529				14,490,529	+17
Minnesota	36,856,244				36,856,244	+16
Missouri	40,043				40,043	−50
Montana	(1)	[1] 3,672			3,672	−6
New Jersey			202,942		202,942	+211
New Mexico			172,959		172,959	−9
New York	15,731		125,803		141,534	−45
North Carolina		5,753	16,258		22,011	+76
Ohio				2,410	2,410	+888
Pennsylvania		1,039	952,623	2,293	955,955	+18
Tennessee	106,557	58,160			164,717	−8
Utah	[1] 265,322	[1] 4,470	237		270,029	+64
Virginia		96,272			96,272	+7
Washington			830		830	−51
Wisconsin	817,149				817,149	+18
Wyoming	489,622				489,622	+35
	[1] 59,546,690	[1] 884,600	1,472,004	4,703	61,907,997	+14

[1] Some hematite included with brown ore.

The ore reported as sold for fluxing other than in the manufacture of pig iron amounted to 34,876 gross tons, valued at $63,678, as compared with 31,212 tons, valued at $96,209, in 1924. The ore reported sold for purifying gas amounted to 1,969 tons, valued at $16,829. The domestic iron ore sold for the manufacture of pig iron amounted to 63,887,088 gross tons, valued at $160,714,511, as compared with 52,048,419 tons, valued at $151,191,475, in 1924.

[2] Notes on the composition of these ores are given in Mineral Resources, 1916, pt. 1, 1918, pp. 537–541.

Iron ore shipped from mines in the United States, 1924–25, by States and uses, in gross tons

[Exclusive of ore containing 5 per cent or more of manganese]

State	Pig iron	Flux	Paint	Other	Total
1924					
Alabama	6,557,596				6,557,596
California		435			435
Colorado	4,702				4,702
Georgia	112,059		482		112,541
Michigan	11,248,641		2,296		11,250,937
Minnesota	31,076,114				31,076,114
Missouri	79,847				79,847
Montana		3,913			3,913
New Jersey	100,093		208	1,030	101,331
New Mexico	189,371				189,371
New York	303,386		12,966		316,352
North Carolina	12,525				12,525
Ohio	244				244
Pennsylvania	806,397		3,005	1,014	810,416
Tennessee	179,293		560		179,853
Utah	144,525	19,629			164,154
Virginia	91,759				91,759
Washington				1,700	1,700
Wisconsin	786,006		1,113		787,119
Wyoming	355,861	7,235			363,096
	52,048,419	31,212	20,630	3,744	52,104,005
1925					
Alabama	6,891,081				6,891,081
California		352			352
Colorado	8,642				8,642
Georgia	79,488				79,488
Michigan	15,254,003		4,604		15,258,607
Minnesota	38,022,237		84		38,022,321
Missouri	40,043				40,043
Montana		3,672			3,672
New Jersey	162,451	1,142	952	930	165,475
New Mexico	172,959				172,959
New York	413,517		15,731		429,248
North Carolina	22,011				22,011
Ohio	2,410				2,410
Pennsylvania	916,216		2,293	1,039	919,548
Tennessee	164,073		644		164,717
Utah	238,819	29,710			268,529
Virginia	76,302				76,302
Washington				830	830
Wisconsin	933,214		2,213		935,427
Wyoming	489,622				489,622
	63,887,088	34,876	26,521	2,799	63,951,284

Iron ore shipped from mines in the United States, 1924–25, by States

[Exclusive of ore containing 5 per cent or more of manganese and of ore sold for paint]

State	1924		1925		Percentage of increase or decrease	
	Gross tons	Value	Gross tons	Value	Quantity	Value
Alabama	6,557,596	$13,927,551	6,891,081	$14,134,677	+5	+1
California	435	(1)	352	(1)	−19	
Colorado	4,702	(1)	8,642	(1)	+84	
Georgia	112,059	285,128	79,488	231,683	−29	−19
Michigan	11,248,641	35,605,902	15,254,003	40,926,315	+36	+15
Minnesota	31,076,114	93,311,092	38,022,237	96,083,485	+22	+3
Missouri	79,847	405,622	40,043	(1)	−50	
Montana	3,913	10,846	3,672	10,244	−6	−6
New Jersey	101,123	420,488	164,523	678,021	+63	+61
New Mexico	189,371	(1)	172,959	(1)	−9	
New York	303,386	1,448,616	413,517	1,988,735	+36	+37
North Carolina	12,525	32,512	22,011	49,511	+76	+52
Ohio	244	(1)	2,410	(1)	+888	
Pennsylvania	807,411	1,881,122	917,255	2,149,800	+14	+14
Tennessee	179,293	431,682	164,073	369,144	−8	−14
Utah	164,154	234,348	268,529	361,251	+64	+54
Virginia	91,759	250,279	76,302	174,454	−17	−30
Washington	1,700	(1)	830	(1)	−51	
Wisconsin	786,006	2,044,762	933,214	2,260,388	+19	+11
Wyoming	363,096	(1)	489,622	(1)	+35	
Undistributed		[2] 1,017,155		[2] 1,379,178		
	52,083,375	151,307,105	63,924,763	160,796,886	+23	+6

[1] Included under "Undistributed." [2] This figure includes value for States entered as "(1)" above.

Iron ore shipped from mines in the United States, 1916–1925

[Exclusive of ore containing 5 per cent or more of manganese and of ore sold for paint]

Year	Gross tons	Value	Year	Gross tons	Value
1916	77, 870, 553	$181, 902, 277	1921	26, 652, 528	$89, 745, 308
1917	75, 573, 207	238, 260, 444	1922	50, 612, 620	157, 809, 286
1918	72, 021, 202	244, 368, 147	1923	69, 811, 472	240, 738, 921
1919	56, 372, 784	197, 312, 517	1924	52, 083, 375	151, 307, 105
1920	69, 281, 341	285, 006, 327	1925	63, 924, 763	160, 796, 886

Iron ore mined in the United States, by mining districts and varieties, 1924–25, in gross tons

[Exclusive of ore containing 5 per cent or more of manganese]

District	Hematite	Brown ore	Magnetite	Carbonate	Total	Percentage of increase or decrease in 1925
1924						
Lake Superior [1]	44, 796, 766		44, 953		44, 841, 719	
Birmingham	6, 214, 381	296, 931			6, 511, 312	
Chattanooga	376, 693	171, 004			547, 697	
Adirondack			197, 437		197, 437	
Northern New Jersey and southeastern New York			110, 626		110, 626	
Other districts	[2] 714, 460	[2] 346, 224	994, 695	3, 249	2, 058, 628	
	[2] 52,102, 300	[2] 814, 159	1, 347, 711	3, 249	54, 267, 419	
1925						
Lake Superior [1]	52, 056, 663				52, 056, 663	+16
Birmingham	6, 312, 207	323, 599			6, 635, 806	+2
Chattanooga	259, 843	96, 877			356, 720	−35
Adirondack						
Northern New Jersey and southeastern New York			328, 745		328, 745	+7
Other districts	[2] 917, 977	[2] 464, 124	1, 143, 259	4, 703	2, 530, 063	+23
	[2] 59,546, 690	[2] 884, 600	1, 472, 004	4, 703	61, 907, 997	+14

[1] Includes only those mines in Wisconsin which are in the true Lake Superior district.
[2] Some hematite included with brown ore.

The Lake Superior district, which comprises Minnesota, Michigan, and northern Wisconsin, mined 84 per cent of the total ore in 1925; and the Birmingham district mined 11 per cent. The Chattanooga and Adirondack districts were the only ones to produce less ore in 1925 than in 1924.

The following table shows the production of iron ore in the United States so far as it has been recorded or estimated. The figures for the years prior to 1860 are not strictly accurate, as they were calculated from the pig iron produced and included both imported and domestic ore. Details for the years 1880 to 1916 may be found in Mineral Resources for 1916.

Iron ore mined in the United States, 1810–1925, in gross tons

[Exclusive after 1905 of ore containing 5 per cent or more of manganese]

Year	Hematite	Brown ore	Magnetite	Carbonate	Total
1810–1869					49,656,000
1870–1880					51,690,889
1881–1890					103,854,386
1891–1900	136,961,046	22,845,764	14,624,364	1,065,137	175,506,311
1901–1910	364,179,432	[2] 28,287,994	[2] 20,664,453	262,366	413,394,245
1911–1915	239,419,251	8,355,102	10,156,539	42,495	257,973,387
1916	70,728,024	1,904,484	2,533,364	1,800	75,167,672
1917	70,743,513	1,992,332	2,553,006		75,288,851
1918	65,894,709	1,613,844	2,149,725		69,658,278
1919	[3] 57,719,582	1,127,397	[3] 2,118,439		60,965,418
1920	[3] [4] 63,883,523	[4] 1,325,661	[3] 2,391,541	3,740	67,604,465
1921	[3] [4] 28,337,249	[4] 370,154	[3] 780,866	2,709	29,490,978
1922	[4] 44,888,723	[4] 783,582	1,452,966	3,256	47,128,527
1923	[4] 65,924,454	[4] 1,232,848	2,190,624	3,516	69,351,442
1924	[4] 52,102,300	[4] 814,159	1,347,711	3,249	54,267,419
1925	[4] 59,546,690	[4] 884,600	1,472,004	4,703	61,907,997
					1,662,906,265

[1] Includes ore produced by owners of blast furnaces, estimated by census at 800,000 tons.
[2] Some brown ore included with magnetite.
[3] Some magnetite included with hematite.
[4] Some hematite included with brown ore.

PRINCIPAL IRON-ORE MINES

In 1925 there were 238 iron-ore mines active, compared with 260 in 1924 and 309 in 1923; 130 mines produced more than 100,000 gross tons of iron ore each, compared with 117 in 1924 and 139 in 1923. Of these 130 mines, 10 (8 in Minnesota, 1 in Alabama, and 1 in Michigan) produced more than 1,000,000 tons each, as against 9 (7 in Minnesota, 1 in Alabama, and 1 in Michigan) in both 1924 and 1923. The operators of all but one of these large mines have permitted the publication of output, and the figures are given in the table that follows. The predominance of hematite as an iron ore is clearly shown by the fact that of these 130 large mines only 5 produced magnetite and 1 produced brown ore. The trend toward large mining units is shown in the production of nearly 96 per cent of the output of the country by the 130 mines that yielded more than 100,000 tons each. The 10 mines that produced more than 1,000,000 tons each in 1925 furnished over 37 per cent of the total. The average production per mine in 1925 was 260,118 tons, as compared with 208,721 tons in 1924.

Iron-ore mines of the United States that produced more than 100,000 gross tons each in 1925

Rank	Name of mine	State	Nearest town	Variety of ore	Gross tons
1	Hull-Rust	Minnesota	Hibbing	Hematite	5,141,909
2	Missabe Mountain	do	Virginia	do	3,605,071
3	Red Mountain group	Alabama	Bessemer	do	3,517,293
4	Mahoning	Minnesota	Hibbing	do	1,818,560
5	Canisteo	do	Coleraine	do	1,749,416
6	Morris	do	Hibbing	do	1,639,229
7	Spruce	do	Eveleth	do	1,565,636
8	Norrie group	Michigan	Ironwood	do	1,475,871
9	Sellers	Minnesota	Hibbing	do	1,380,377
10	Hill Annex	do	Calumet	do	1,210,344
11	Woodward Nos. 1, 2, and 3	Alabama	Bessemer	do	975,028
12	Holman	Minnesota	Taconite	do	864,931
13	Newport (including Bonnie)	Michigan	Ironwood	do	845,286
14	Cornwall	Pennsylvania	Miners Village	Magnetite	830,256
15	Dunwoody	Minnesota	Chisholm	Hematite	776,312
16	Bennett	do	Keewatin	do	661,263

Iron-ore mines of the United States that produced more than 100,000 gross tons each in 1925—Continued

Rank	Name of mine	State	Nearest town	Variety of ore	Gross tons
17	Fayal	Minnesota	Eveleth	Hematite	654,735
18	Pioneer	do	Ely	do	646,697
19	Leonidas	do	Eveleth	do	636,276
20	Sloss Nos. 1 and 2	Alabama	Bessemer	do	604,126
21	Wakefield	Michigan	Wakefield	do	603,856
22	Montreal	Wisconsin	Montreal	do	582,466
23	Glen	Minnesota	Chisholm	do	580,635
24	Hill-Trumbull	do	Marble	do	504,987
25	Adams	do	Eveleth	do	499,903
26	Boeing	do	Hibbing	do	498,473
27	Raimund Nos. 1 and 2	Alabama	Bessemer	do	492,828
28	Sunrise	Wyoming	Sunrise	do	489,622
29	Ironton	Michigan	Bessemer	do	472,800
30	Plymouth	do	Wakefield	do	471,930
31	North Harrison	Minnesota	Pengilly	do	460,536
32	Webb	do	Hibbing	do	438,333
33	Hawkins	do	Nashwauk	do	434,355
34	Chapin (including Millie)	Michigan	Iron Mountain	do	423,489
35	Wellington	Minnesota	Chisholm	do	420,971
36	Miller	do	Aurora	do	409,337
37	Scranton	do	Hibbing	do	404,026
38	Utica	do	do	do	382,009
39	Corsica	do	McKinley	do	380,688
40	Cliffs Shaft	Michigan	Ishpeming	do	374,356
41	Leonard	Minnesota	Chisholm	do	366,544
42	Wabigon	do	Buhl	do	357,054
43	Penn group	Michigan	Norway and Vulcan	do	356,889
44	Negaunee	do	Negaunee	do	350,246
45	Eureka	do	Ramsay	do	346,169
46	Bristol	do	Crystal Falls	do	345,600
47	Lake Superior	do	Ishpeming	do	340,004
48	Patrick	Minnesota	Pengilly	do	337,703
49	Danube	do	Bovey	do	328,745
50	Redding	Alabama	Bessemer	do	327,725
51	Zenith	Minnesota	Ely	do	314,551
52	Palms	Michigan	Bessemer	do	306,821
53	South Judd	Minnesota	Taconite	do	303,012
54	Berkshire	Michigan	Stambaugh	do	301,824
55	Biwabik (including Cincinnati).	Minnesota	Biwabik	do	301,406
56	Alexandria	do	Chisholm	do	300,510
57	Russellville	Alabama	Russellville	Brown ore	291,869
58	Laura	Minnesota	Hibbing	Hematite	286,437
59	La Rue	do	Nashwauk	do	283,786
60	Richmond	Michigan	Palmer	do	283,002
61	South Agnew	Minnesota	Buhl	do	276,591
62	Morris-Lloyd	Michigan	Ishpeming	do	265,829
63	Hiawatha	do	Iron River	do	261,818
64	Maitland	do	Palmer	do	257,848
65	Caspian	do	Iron River	do	253,779
66	Sargent	Minnesota	Keewatin	do	253,616
67	Stephenson	Michigan	Gwinn	do	253,193
68	Aragon	do	Norway	do	252,828
69	Armour No. 2 (including Cuyuna-Duluth).	Minnesota	Crosby	do	251,233
70	Imperial	Michigan	Michigamme	do	250,783
71	Bengal	do	Iron River	do	245,348
72	Higgins No. 2	Minnesota	Virginia	do	244,675
73	James	Michigan	Iron River	do	239,983
74	Iron Springs	Utah	Iron Springs	do	238,074
75	Harold	Minnesota	Stuntz	do	234,948
76	Puritan	Michigan	Ironwood	do	234,837
77	Kinney	Minnesota	Kinney	do	228,630
78	Shannon	Alabama	Birmingham	do	227,889
79	Wanless	Minnesota	Buhl	do	226,602
80	Dean	do	do	do	223,746
81	Lincoln	do	Virginia	do	223,668
82	Chisholm	do	Chisholm	do	221,392
83	Homer	Michigan	Iron River	do	221,150
84	Athens	do	Negaunee	do	210,144
85	Susquehanna	Minnesota	Hibbing	do	206,968
86	Sibley	do	Ely	do	205,704
87	Asteroid	Michigan	Ramsay	do	203,293
88	Albany	Minnesota	Hibbing	do	201,943
89	Riverton group	Michigan	Iron River	do	201,793
90	Commodore	Minnesota	Virginia	do	200,024
91	Mary Charlotte	Michigan	Negaunee	do	198,956
92	Shenango	Minnesota	Chisholm	do	198,274
93	Shada	do	Nashwauk	do	194,350
94	Leetonia	do	Carson Lake	do	194,291
95	Baltic (including Fogarty and Buck).	Michigan	Iron River	do	194,287

Iron-ore mines of the United States that produced more than 100,000 gross tons each in 1925—Continued

Rank	Name of mine	State	Nearest town	Variety of ore	Gross tons
96	Monongahela	Michigan	Crystal Falls	Hematite	192,330
97	Meacham	Minnesota	Crosby	do	190,423
98	Holmes	Michigan	Ishpeming	do	188,500
99	Balkan (including Judson)	do	Alpha	do	177,385
100	Warner	do	Amasa	do	176,309
101	Union Hill (including Republic).	New Mexico	Fierro	Magnetite	172,904
102	Irondale No. 2	Alabama	Irondale	Hematite	167,318
103	Isabella	Michigan	Palmer	do	161,137
104	Sunday Lake	do	Wakefield	do	156,682
105	Kerr	Minnesota	Hibbing	do	153,047
106	Zimmerman	Michigan	Gaastra	do	152,373
107	Maas	do	Negaunee	do	149,879
108	Tilden	do	Bessemer	do	148,034
109	Keweenaw	do	do	do	146,389
110	Carpenter	do	Crystal Falls	do	146,030
111	Attalla No. 1	Alabama	Attalla	do	140,788
112	Barnes Hecker	Michigan	Ishpeming	do	138,582
113	Mt. Hope	New Jersey	Wharton	Magnetite	134,562
114	Davidson No. 1	Michigan	Iron River	Hematite	133,932
115	Rogers	do	do	do	131,562
116	Cambria (including Lalley)	do	Negaunee	do	129,198
117	Rolling Mill	do	do	do	124,628
118	Little and Primile	Minnesota	Keewatin	do	123,584
119	French Creek	Pennsylvania	St. Peters	Magnetite	122,367
120	Philbin	Minnesota	Hibbing	Hematite	121,469
121	Smith	do	do	do	115,209
122	Soudan	do	Soudan	do	114,718
123	Mary Ellen	do	Biwabik	do	113,638
124	Mikado	Michigan	Wakefield	do	110,178
125	Mayville	Wisconsin	Mayville	do	106,743
126	Marceo	Minnesota	Ironton	do	106,405
127	(1)	(1)	(1)	(1)	105,433
128	Bates	Michigan	Iron River	Hematite	102,341
129	Lamberton	Minnesota	Hibbing	do	102,339
130	Tobin	Michigan	Crystal Falls	do	100,387
	Total (130 mines)				59,209,663
	Output of 22 mines producing between 50,000 and 100,000 gross tons each				1,523,988
	Output of 86 mines producing less than 50,000 gross tons each				1,174,346
	Grand total of United States (238 mines)				61,907,997

[1] Bureau of Mines not at liberty to publish identification.

STOCKS OF IRON ORE AT MINES

According to the reports of producers, the total quantity of iron ore in stock at the mines at the end of 1925 amounted to 10,795,630 gross tons, compared with 12,410,619 tons at the end of 1924, a decrease of 13 per cent. As the quantity of ore in stock piles is of necessity partly estimated, resulting variations in the mine reports from year to year prevent an absolute balance between the quantity mined, the quantity shipped, and the stocks on hand. The reported stocks at the end of 1925 were about 867,500 tons below the average for the preceding five years.

Stocks of iron ore at mines December 31, 1924 and 1925, by States, in gross tons

State	1924	1925	State	1924	1925
Alabama	740,279	942,448	New York	441,492	153,776
Georgia	633		Pennsylvania	1,200	37,907
Iowa	12,165	12,165	Utah		1,934
Michigan	7,399,506	6,769,006	Virginia	6,503	26,473
Minnesota	3,537,237	2,845,343	Wisconsin	159,045	54,075
Missouri	3,079	2,629			
New Jersey	109,461	149,974		12,410,619	10,795,630

VALUE OF IRON ORE PER TON

The table that follows gives the average value, at the mines, of the different classes of iron ore in 1924 and 1925 for each of the producing States or groups of States except where the shippers of a certain variety of ore in a State were less than three and permission was not given to publish the value. These figures are taken directly from statements of the producers and probably represent the commercial selling prices only approximately, as all the reports are not consistent. Some of them evidently include mining costs only; others contain, in addition, the cost of selling and insuring the ore; others include an allowance for a sinking fund; and still others are the costs charged against the blast furnaces. None of the reports, however, is supposed to include freight charges.

Average value per gross ton of iron ore at mines in the United States, 1924–25 [1]

[Exclusive of ore containing 5 per cent or more of manganese and of ore sold for paint]

State	Hematite		Brown ore		Magnetite	
	1924	1925	1924	1925	1924	1925
Alabama	$2.06	$1.98	$2.74	$2.79	----------	----------
Georgia	(2)	(2)	2.73	3.04	----------	----------
Michigan	3.17	2.68	----------	----------	----------	----------
Minnesota	3.00	2.53	----------	----------	(3)	----------
Montana	(3)	(3)	[3] 2.77	[3] 2.79	----------	----------
New Jersey	----------	----------	(3)	(3)	(3)	$4.11
New York	----------	----------	----------	----------	$4.77	4.81
North Carolina	----------	----------	2.60	2.30	----------	(3)
Pennsylvania	----------	----------	(3)	(3)	2.32	2.33
Tennessee	(3)	1.97	(3)	2.77	----------	----------
Virginia	----------	----------	2.73	2.29	----------	----------
Wisconsin	2.60	2.42	----------	----------	(3)	----------
Other States [4]	2.13	1.71	2.95	3.31	2.71	1.94
	2.91	2.50	2.75	2.78	2.95	3.07

[1] Carbonate of iron, used in making pig iron, was sold by one producer in Ohio in 1924 and 1925.
[2] Less than three producers and permission to publish not given, therefore value may not be shown.
[3] Value for hematite included with brown ore.
[4] 1924: California, Colorado, Missouri, New Jersey, New Mexico, Tennessee, Utah, Washington, and Wyoming. 1925: California, Colorado, Missouri, New Mexico, Utah, Washington, and Wyoming.

The following table summarizes the average value of iron ore at the mines for the years 1913 to 1925. Not until 1917 did the average value rise above $3 a ton, and the average for 1920, $4.11, is the highest on record.

Average value per gross ton of iron ore at mines in the United States, 1913–1925

[Exclusive of ore containing 5 per cent or more of manganese and of ore sold for paint]

Year	Hematite	Brown ore	Magnetite	Carbonate	General average [1]
1913	$2.21	$1.88	$2.07	$2.06	$2.19
1914	1.76	1.72	2.39	2.44	1.81
1915	1.80	1.80	2.50	2.44	1.83
1916	2.32	2.03	3.11	3.00	2.34
1917	3.12	2.97	4.29	----------	3.15
1918	3.35	3.51	4.60	----------	3.39
1919	3.48	3.63	4.08	----------	3.50
1920	4.09	4.19	4.59	(2)	4.11
1921	3.37	2.63	3.61	(2)	3.37
1922	3.14	2.65	2.37	(2)	3.11
1923	3.46	2.88	3.34	(2)	3.43
1924	2.91	2.75	2.95	(2)	2.91
1925	2.50	2.78	3.07	(2)	2.62

[1] Average values in 1889 and 1899–1912 are given in Mineral Resources for 1919 and many earlier volumes.
[2] Sold for paint and not included in shipments of iron ore.
[3] Carbonate of iron, used in making pig iron, was sold by one producer in Ohio in 1924 and 1925; that from Pennsylvania was sold for paint.

IRON ORE CONSUMED

The furnaces in Alabama consumed in 1925 an average of 2.466 tons of ore in making a ton of pig iron, the most for any State. The greater part of the ore used in Alabama furnaces is hematite carrying between 33 and 51 per cent of iron and is obtained from mines in Etowah and Jefferson Counties, Ala., and in Walker County, Ga. The brown ore used carried between 43 and 52 per cent of iron and was obtained chiefly from mines in the Birmingham and Russellville districts, Ala., and the Cedartown district, Ga.

The furnaces in Maryland, on the other hand, used mostly foreign ores—chiefly from Chile, Cuba, and Sweden—which have an iron content of about 65, 57, and 65 per cent, respectively. The Maryland furnaces consumed an average of only 1.470 tons of ore in making a ton of pig iron, the lowest for any State, but they used proportionately more mill cinder, scale, and scrap than the furnaces in Alabama.

The furnaces in Indiana, Michigan, Minnesota, Ohio, and West Virginia use Lake Superior iron ore exclusively, and the furnaces in Wisconsin use ore from mines in the Lake Superior district and from the Mayville mine, in southern Wisconsin. The consumption of ores per ton of iron made ranges between 1.641 and 1.915 tons.

All the ore used by the furnaces in the Chicago district, including Joliet, Ill., and most of that used by the furnace at Granite City are obtained from mines in the Lake Superior district. In addition, the furnace at Granite City uses ore from the Baraboo district, in southern Wisconsin, which carries about 46 per cent of iron, and ore from the Rueppele and Iron Mountain mines in Missouri, the iron content of which is about 51 and 57 per cent, respectively.

Kentucky, consuming ore from the Lake Superior district and a little carbonate ore from Ohio, used an average of 0.302 ton of mill cinder, scale, and scrap to a ton of pig iron and therefore used an average of only 1.531 tons of ore to a ton of pig iron.

In New York, the furnaces in the Buffalo district use ore from the Lake Superior district and from Port Henry, N. Y., and the furnaces at Port Henry and Standish use local magnetites that carry between 60 and 64 per cent of iron. In the manufacture of a ton of pig iron an average of 1.84 tons of ore was used by these furnaces in 1925.

The furnaces in western Pennsylvania use ore mostly from the Lake Superior district; those in the eastern part of the State, in addition to using some Lake ore, use magnetite from the Cornwall and French Creek mines in Pennsylvania, which carries between 44 and 58 per cent of iron, New Jersey magnetite carrying 58 to 60 per cent of iron, New York magnetite carrying between 60 and 64 per cent of iron, and considerable quantities of ores from Africa, Chile, Cuba, Spain, and Sweden that carry 47 to 67 per cent of iron. An average of 1.728 tons of ore was used in 1925 to make a ton of pig iron.

The iron furnaces in Tennessee use brown ore from Lyles, Tenn., hematite from the Rockwood area, which carries between 35 and 41 per cent of iron, magnetite carrying about 42 per cent of iron from the Cranberry mine in North Carolina, brown ore from the Pace and Cover mines in Cherokee County, N. C., and brown ore from the

Bartow and Reed mines in Georgia and the Rendalia mine in Alabama. In addition, some ore from Sweden and Africa was used. An average of 2.435 tons of ore and 0.193 ton of cinder, scale, and scrap—a total of 2.628 tons, the most for any State—was used per ton of iron made in 1925.

Virginia iron furnaces use local brown ores averaging between 40 and 54 per cent of iron, a small quantity of Lake Superior iron ore, and some ore from France. These furnaces also used 0.346 ton of cinder, scale, and scrap to a ton of pig iron, the highest average for any State. The consumption of ore per ton of iron made was 1.748 tons.

The blast furnaces at Pueblo, Colo., used brown ore from the Orient mine in Colorado, hematite from the Sunrise mine in Wyoming, and magnetite from mines near Fierro, N. Mex. The blast furnace at Provo, Utah, used some iron ore from the Iron King mine, near Eureka, Utah, but by far the greater part was obtained from mines in the Iron Springs district, Utah.

The following two tabulations show the consumption of iron ore and other metallic materials, the production of pig iron (as reported to the Bureau of Mines), and the average quantities of materials used per ton of pig iron made.

Iron ore and other metallic materials consumed and pig iron produced in 1925, by States, in gross tons

State	Metalliferous materials consumed				Pig iron produced, exclusive of ferro-alloys	Materials consumed per ton of iron made		
	Iron and manganiferous iron ores		Cinder, scale, and scrap	Total		Ores	Cinder, scale, and scrap	Total
	Domestic	Foreign						
Alabama	6,936,782	5,903	332,755	7,275,440	2,815,728	2.466	0.118	2.584
Colorado	(1)		(1)	(1)	(1)	(1)	(1)	(1)
Illinois	6,487,199		392,299	6,879,498	3,604,255	1.800	.109	1.909
Indiana	5,985,867		615,681	6,601,548	3,353,217	1.785	.184	1.969
Kentucky	238,627		47,132	285,759	155,886	1.531	.302	1.833
Maryland	18,892	989,288	88,977	1,097,157	685,662	1.470	.130	1.600
Michigan	1,264,743		71,690	1,336,433	766,594	1.650	.093	1.743
Minnesota	522,688		30,533	553,221	272,876	1.915	.112	2.027
New York	3,826,986		202,012	4,028,998	2,079,528	1.840	.097	1.937
Ohio	14,391,750		1,627,910	16,019,660	8,771,137	1.641	.185	1.826
Pennsylvania	19,807,144	1,331,329	1,569,099	22,707,572	12,236,780	1.728	.128	1.856
Tennessee	224,947	5,210	18,286	248,443	94,516	2.435	.193	2.628
Utah	(1)		(1)	(1)	(1)	(1)	(1)	(1)
Virginia	192,980	6,037	39,429	238,446	113,878	1.748	.346	2.094
West Virginia	862,022		34,020	896,042	494,598	1.743	.069	1.812
Wisconsin	338,081		23,354	361,435	195,603	1.729	.119	1.848
Undistributed	[2] 931,026		[2] 43,891	[2] 974,917	[2] 484,420	[2] 1.922	[2] .091	[2] 2.013
	62,029,734	2,337,767	5,137,068	69,504,569	36,124,678	1.782	.142	1.924

[1] Included under "Undistributed." [2] Includes figures for States entered as "(1)" above.

Iron ore and other metallic materials consumed and pig iron produced in the United States, 1916–1925, in gross tons

Year	Metalliferous materials consumed				Pig iron produced exclusive of ferro-alloys	Materials consumed per ton of iron made			
	Iron and manganiferous iron ores		Cinder, scale, and scrap	Total		Ores		Cinder, scale, and scrap	Total
	Domestic	Foreign				Domestic	Foreign		
1916	70,769,337	1,295,518	4,036,022	76,100,877	38,701,963	1.829	0.033	0.104	1.966
1917	69,108,181	749,174	5,647,723	75,505,078	37,924,490	1.822	.020	.149	1.991
1918	69,905,547	690,145	5,343,963	75,939,655	38,130,786	1.833	.018	.140	1.991
1919	54,950,623	520,785	3,721,448	59,192,856	30,508,122	1.801	.017	.122	1.940
1920	64,671,894	968,313	5,650,128	71,290,335	36,242,748	1.784	.027	.156	1.967
1921	28,847,395	372,038	2,269,864	31,489,297	16,403,627	1.759	.023	.138	1.920
1922	46,485,690	910,205	4,285,187	51,681,082	26,826,210	1.733	.034	.160	1.927
1923	69,272,579	2,084,094	5,376,448	76,733,121	39,767,482	1.742	.052	.135	1.929
1924	51,880,562	2,012,689	4,646,320	58,539,571	30,869,199	1.681	.065	.150	1.896
1925	62,029,734	2,337,767	5,137,068	69,504,569	36,124,678	1.717	.065	.142	1.924

Foreign iron and manganiferous iron ores consumed in the manufacture of pig iron in the United States, 1924–25, by sources of ore, in gross tons

Source of ore	1924	1925	Source of ore	1924	1925
Africa	212,746	269,239	Russia	84	100
Brazil	2,981	450	Spain	100,955	162,225
Chile	883,198	994,439	Sweden	280,696	285,724
Cuba	484,058	559,562	Undistributed	14,083	40,393
France		6,037		2,012,689	2,337,767
Greece	12,177	19,598			
Newfoundland	21,711				

LAKE SUPERIOR DISTRICT

PRODUCTION

The total quantity of iron ore mined in the Lake Superior district, not including the Iron Ridge area in Wisconsin, increased 16 per cent in 1925. The output of the several ranges is shown in the table that follows. After 1905 the figures do not include manganiferous iron ore containing 5 per cent or more of manganese; 1,321,841 gross tons of this ore was mined in 1925, compared with 787,253 tons in 1924. The Mesabi range produced 67 per cent of the iron-ore output of the Lake Superior district and 56 per cent of the total output of the United States in 1925. The proportion contributed by this range has been remarkably uniform since 1915, but was slightly over the average in 1925. Production increased on all the iron ranges except the Cuyuna which showed a decrease of 28 per cent, but that decrease was more than offset by the increased output of manganiferous iron ore from the range. Moreover, for the first time since the opening of the Cuyuna range the production of manganiferous iron ore was greater than that of iron ore.

Iron ore mined in the Lake Superior district, 1854–1925, in gross tons

[Exclusive after 1905 of ore containing 5 per cent or more of manganese]

Year	Marquette	Menominee	Gogebic	Vermilion	Mesabi	Cuyuna	Total
1854–1870	3,971,716						3,971,716
1871–1880	10,294,047	858,810					11,152,857
1881–1890	18,598,012	11,917,416	8,657,807	3,260,426			42,433,661
1891–1900	27,269,545	21,639,872	23,361,043	12,097,048	32,282,873		116,650,381
1901–1910	37,728,143	41,974,789	34,514,899	15,350,581	194,654,902		324,223,314
1911–1915	18,404,620	21,862,454	21,366,821	7,234,387	142,721,213	3,191,627	214,781,122
1916	4,792,987	6,649,578	7,707,191	1,704,440	41,325,341	1,555,641	63,735,088
1917	4,638,374	6,366,483	7,881,232	1,481,301	41,127,323	1,986,608	63,481,321
1918	3,946,554	6,041,637	7,837,634	1,192,677	39,055,977	1,705,315	59,779,794
1919	4,158,751	4,863,968	7,368,994	1,051,795	33,262,954	1,685,877	52,392,339
1920	4,457,609	5,651,542	8,298,206	1,053,518	36,641,880	1,757,775	57,860,530
1921	2,204,114	2,147,569	3,135,477	981,576	16,380,190	449,559	25,298,485
1922	2,745,626	3,290,641	4,910,789	1,108,764	26,704,601	955,595	39,716,016
1923	3,916,909	4,913,541	6,112,662	1,119,113	41,809,018	1,420,165	59,285,408
1924	3,579,087	3,780,664	5,579,883	1,141,690	29,818,965	941,430	44,841,719
1925	3,813,687	5,009,022	6,377,710	1,331,753	34,851,109	673,382	52,056,663
	154,513,781	146,967,986	153,110,258	50,109,069	710,636,346	16,322,974	1,231,660,414

SHIPMENTS AND RECEIPTS

According to the Lake Superior Iron Ore Association, 55,534,812 gross tons of iron ore and manganiferous iron ore was shipped in 1925 from the Lake Superior district, including the Iron Ridge and Baraboo areas in Wisconsin, as compared with 43,896,318 tons in 1924. The shipments as reported by producers to the Bureau of Mines amounted to 54,216,355 gross tons of iron ore and 1,321,841 gross tons of manganiferous iron ore containing 5 per cent or more of manganese, a total of 55,538,196 tons in 1925, compared with 43,114,170 tons of iron ore and 787,253 tons of manganiferous iron ore, a total of 43,901,423 tons in 1924.

The iron ore received at Lake Erie ports, according to the Marine Review, amounted to 39,646,335 gross tons and at Lake Michigan ports, 13,291,027 gross tons, a total of 52,937,362 tons in 1925, compared with 32,420,582 tons at Lake Erie ports and 9,202,099 tons at Lake Michigan ports, a total of 41,622,681 tons in 1924. Detailed figures of shipments and receipts by ports and by months for recent years can be found in the Marine Review.

STOCKS OF IRON ORE AT LAKE ERIE PORTS

Stocks of iron ore at lower Lake ports at the end of the shipping season are important because of their bearing on the manufacture of pig iron during the following winter and spring. At the close of navigation in 1925 there was 7,856,154 gross tons of ore in stock at Lake Erie ports, compared with 8,049,276 tons at the corresponding date in 1924.[3] At the opening of navigation in May, 1926, there was 4,575,390 gross tons of ore in stock at these ports, indicating a withdrawal of 3,280,764 tons during the winter of 1925–26. The average quantity withdrawn each winter during the preceding five winters was about 3,695,000 tons. Detailed statistics concerning these stocks by ports can be found in the Marine Review.

[3] Marine Review

PRICES OF LAKE SUPERIOR IRON ORE

The price of iron ore per unit of iron in the natural state for the four standard grades of Lake Superior ore for the last 26 years is shown in the Iron Trade Review.[4] The base of Bessemer ore, old-range and Mesabi, for 1925 is a metallic iron content of 51.5 per cent, natural, instead of 55 per cent as for 1924 and many earlier years. The base for non-Bessemer ore, old-range and Mesabi, remains as heretofore at 51.5 per cent, natural. The unit prices established April 4, 1925, are as follows: Old-range Bessemer, 8.835 cents; Mesabi Bessemer, 8.544 cents; old-range non-Bessemer, 8.544 cents; Mesabi non-Bessemer, 8.252 cents. The prices per ton that correspond to these unit prices are, respectively, $4.55, $4.40, $4.40, and $4.25. The prices for 1925 are the lowest that have been in effect since the season of 1916. The lowest prices ever quoted for these ores were $2.60 for old-range Bessemer in 1897, $2.15 for Mesabi Bessemer in 1895, $1.85 for old-range non-Bessemer in 1898, and $1.75 for Mesabi non-Bessemer in 1898.

IRON-ORE RESERVES

Estimates of ore reserves for Minnesota, furnished by the Minnesota Tax Commission, and for Michigan, furnished by the Michigan Board of State Tax Commissioners, cover developed and prospective ore in the ground and ore in stock piles. These estimates show a decrease of about 18,888,000 gross tons in Minnesota and an increase of about 675,000 tons in Michigan. The Vermilion and Cuyuna ranges in Minnesota and the Gogebic and Menominee ranges in Michigan each showed increases in 1925.

Iron-ore reserves in Minnesota May 1, 1922–1925, in gross tons

Range	1922	1923	1924	1925
Mesabi	1,252,820,242	1,254,861,451	1,275,347,126	1,250,086,347
Vermilion	14,354,328	13,688,352	13,169,953	13,539,256
Cuyuna	29,485,159	43,041,100	46,121,021	52,124,561
	1,296,659,729	1,311,590,903	1,334,638,100	1,315,750,164

Iron-ore reserves in Michigan January 1, 1923–1926, in gross tons

Range	1923	1924	1925	1926
Gogebic	58,314,512	54,949,558	51,646,890	52,136,121
Marquette	72,102,521	70,384,149	68,978,647	67,160,777
Menominee (including Iron River and Crystal Falls districts)	66,409,915	66,555,393	67,184,024	69,188,118
	196,826,948	191,889,100	187,809,561	188,485,016

[4] Iron Trade Review, Vol. 76, Apr. 9, 1925, pp. 978–979.

IRON-ORE MINING, BY STATES

LAKE SUPERIOR DISTRICT

The outstanding features of mining developments in the Lake Superior iron mining districts are described in articles published in trade and mining journals.[5]

Michigan.—Mining activity on the Michigan iron ranges is shown by a gain in production of 17 per cent. The ore reserves in Michigan on January 1, 1926, showed an increase of about 675,000 tons—evidence that new discoveries more than kept pace with production. The increasing demand for siliceous ore caused much activity, chiefly on the Marquette range, in the development of such ore. The use of electricity expanded considerably in 1925, mainly in the electrification of underground mining equipment although electric shovels were being installed at some siliceous mines. The installation of crushing plants made much progress, and it is reported that on the Menominee range the placing of crushers underground is becoming of increasing importance.

Minnesota.—Mining activity on the Minnesota iron ranges is shown by the increase in production of 16 per cent. Exploration, however, does not seem to have been pushed, the new ore discovered during the year apparently not being enough to keep pace with production. The Harrison Annex and Wabigon mines made initial shipments during 1925. The ore bodies at some mines were virtually exhausted during the year and mining operations were abandoned, and many leases were canceled due to the inability of companies to operate profitably under existing conditions. There was a continuation in the consolidation of ore properties. Additional equipment for the preparation of iron ore for the market was installed during 1925. Stripping operations were fairly active, chiefly on the Mesabi range, and several mines are ready to begin shipping. The use of electric power continues to expand, mainly in the electrification of underground mining equipment, although more of the larger types of shovels for surface and open-pit work are being operated electrically. Ore cars of 75 tons capacity were placed on the Soo Line to handle Cuyuna range ore and 85-ton cars were put in service on the Mesabi range.

Wisconsin.—The production of iron ore in Wisconsin showed an increase of 18 per cent in 1925. Most of the output was from the Gogebic range. The Montreal Mining Co. completed its No. 5 shaft at Montreal and produced ore from it during 1925. The Florence mine, on the Menominee range, was active in 1925 as was also the Mayville mine, in southern Wisconsin. The Cahoon mine, in southern Wisconsin, last productive in 1919 but having a good-sized stockpile from which shipments had been made during 1920, 1922, 1923, and 1924, shipped the last of this stockpile in 1925.

Iron-ore analyses.—The iron content of the ore shipped from the Lake Superior district in 1925 averaged 51.74 per cent, natural, or slightly more than the average in 1924, which was 51.72 per cent. The content of phosphorus and silica decreased somewhat but the manganese content increased 0.06 per cent.

---

[5] Hain, A. J., "Iron ore industry in stronger hands": Iron Trade Review, vol. 78, Jan. 7, 1926, pp. 73–76, 104; Woodbridge, D. E., "Reduced ore piles raise hopes": Iron Age, vol. 117, Jan. 14, 1926, pp. 130–133; Skillings' Mining Review (various issues).

The following table, compiled by the Lake Superior Iron Ore Association, summarizes the average analyses of the total tonnages of all grades of ore shipped, and shows the remarkable uniformity maintained during the last 10 years.

Average analyses of total tonnages of all grades of iron ore from all ranges of Lake Superior district, 1916–1925

Year	Gross tons	Fe (natural)	P	SiO_2	Mn	Moisture
1916	65, 191, 903	51. 20	0. 097	8. 00	0. 73	11. 58
1917	62, 521, 465	51. 40	. 099	8. 02	. 76	11. 57
1918	61, 972, 871	51. 29	. 104	8. 12	. 87	11. 29
1919	46, 666, 878	51. 57	. 105	8. 04	. 73	11. 34
1920	57, 938, 428	51. 69	. 103	8. 13	. 77	11. 09
1921	22, 523, 989	52. 07	. 087	8. 23	. 62	10. 95
1922	43, 431, 294	51. 87	. 099	8. 23	. 76	10. 78
1923	60, 024, 176	51. 79	. 095	8. 22	. 79	10. 76
1924	43, 276, 165	51. 72	. 100	8. 45	. 76	10. 75
1925	54, 784, 355	51. 74	. 099	8. 42	. 82	10. 58

During this 10-year period the iron content ranged between 51.20 and 52.07 per cent, the phosphorus between 0.087 and 0.105 per cent, the silica between 8 and 8.45 per cent, the manganese between 0.62 and 0.87 per cent, and the moisture between 10.58 and 11.58 per cent. This uniformity does not, of course, indicate that the average grade of the available Lake Superior iron ore is not declining. The grade of shipments has been maintained by methods of beneficiation, which are ever becoming more elaborate, and by mixing ores from different deposits.

SOUTHEASTERN STATES

Alabama.—A little more iron ore was mined in Alabama than in 1924. Most of the ore is hematite, much of which is nearly self-fluxing. Hematite is produced chiefly in Jefferson County and the average iron content of that shipped in 1925 ranged between 33 and 40 per cent. The iron content of the hematite shipped from the Attalla No. 1 mine in Etowah County averaged 38.83 per cent, natural, in 1925, and that of the hematite from the Tumlin Gap mine, also in Etowah County, was reported as 51 per cent, natural.

Alabama is the largest producer of brown ore in the United States; its output of this type of ore in 1925 was more than 2½ times the output of all the other States together. The Russellville district led in production of brown ore in 1925; the iron content of the concentrates shipped averaged 51 per cent. Five mines were active in Tuscaloosa County during 1925; the average iron content of the washed ore shipped was between 45 and 50 per cent. Three mines were active in Blount County in 1925; the average iron content of the washed ore shipped was 50.25 per cent. Small quantities of brown ore were produced in Calhoun, Cherokee, Shelby, and Talladega Counties in 1925; the ore from Calhoun County averaged 46.78 per cent of iron, that from Cherokee County averaged 47 per cent, and that from Shelby County averaged 49 per cent.

Georgia.—The output of iron ore in Georgia in 1925 was 30 per cent less than in 1924. Most of this ore was brown ore from the Cedartown area in Polk County, the remainder being from the

Cartersville district in Bartow County. The hematite was mined mainly at the Estelle mine in Walker County, although the Dirtseller mine in Chattooga County has yielded a small quantity annually for the last four years.

North Carolina.—The production of iron ore in North Carolina in 1925, though small, was 76 per cent more than in 1924 and reflects the activity at the Cranberry mine in Avery County, which was nonproductive in 1924. The ore yielded by this mine is magnetite and that shipped in 1925 averaged 42 per cent of iron, natural. The small output of brown ore in 1925 was obtained from the Pace and Cover mines, near Andrews, Cherokee County.

Tennessee.—Tennessee, which produces both hematite and brown ore, mined 8 per cent less than in 1924. By far the larger part of the ore is hematite, mined near Rockwood and Kingston, Roane County. The iron content (natural) of the Rockwood ore was 35.5 per cent and that of the Kingston ore was 41 per cent. The brown ore mined in 1925 was from the Johnson mine (opened in April, 1925) and the Iron Hill mine (opened in 1924), both near Lyles, Hickman County, and from the Van Leer mine in Lawrence County. The ore from the Van Leer mine is used in the manufacture of ferrophosphorus at Rockdale, Tenn. A small amount of hematite used for paint is mined annually at a deposit near Ooltewah, Hamilton County.

Virginia.—An increase of 7 per cent in output (all brown ore) was recorded by Virginia mines in 1925. The producing mines were the Fenwick in Craig County, which shipped ore averaging about 43 per cent of iron, the Rich Patch in Alleghany County whose shipments averaged about 40 per cent of iron, the Porter in Wythe County, whose shipments averaged about 54 per cent of iron, and the Oriskany in Botetourt County from which no ore was shipped.

MISSOURI

The large decrease in production in Missouri during 1925 reflects the decline in operations at the Iron Mountain mine, in St. Francois County, which was nonproductive until December 1. The Rueppele mine, in Franklin County, increased its production considerably. The ore mined in 1925 was hematite and was shipped to the blast furnace at Granite City, Ill. The ore from the Iron Mountain mine is concentrated. The iron content of the concentrates shipped in 1925 averaged 56.8 per cent. The iron content of the ore from the Rueppele mine averaged 51 per cent, natural, in 1925. The production of iron ore in Missouri is inadequate for the requirements of the furnace at Granite City and by far the larger part of the ore consumed there is obtained from the Lake Superior district and from the Baraboo district in southern Wisconsin. Another blast-furnace stack being erected at Granite City by the St. Louis Coke & Iron Co. will increase the market for iron ore.

NORTHEASTERN STATES

New Jersey.—The mines in New Jersey produced more than three times as much ore in 1925 as in 1924. The Mt. Hope mine near Wharton, Morris County, was the largest producer in 1925; it was idle in 1924. The ore is magnetite and that shipped in 1925 averaged 60.18 per cent of iron. The Richard mine, near Wharton, Morris

County, and the Cannon and Peters mines, near Ringwood Manor, Passaic County, also shipped magnetite in 1925; the ore from the Richard mine averaged 57.85 per cent of iron and that from the Cannon and Peters mines averaged 59 per cent. All the ore shipped from these mines is magnetically concentrated. A small quantity of ore for use in the manufacture of paint and some for use in gas purification was shipped from the Ahles mine, near Buttzville, Warren County.

New York.—Production of iron ore showed a decrease for the third successive year. The decrease in 1925 was 45 per cent. In the Adirondack district, only one mine, the Chateaugay, at Lyon Mountain, produced during the year; the concentrates shipped averaged 62.42 per cent of iron. No ore was produced at Mineville during 1925 but ore from stock piles was shipped from the No. 21, Harmony, and Old Bed mines. Most of the output of the Adirondack district is magnetically concentrated. The average iron content of the concentrates shipped from the No. 21, Harmony, and Old Bed mines in 1925 was 60, 64.03, and 61.76 per cent, respectively. The Forest of Dean mine, near Fort Montgomery, Orange County, in 1925 produced and shipped magnetite that averaged about 62 per cent iron; this ore was not treated before shipment. Most of the ore produced in New York is magnetite, but the State is the largest producer of ore for use in paint. This ore, known as Clinton hematite, is mined in Oneida, Wayne, and Cayuga Counties.

Pennsylvania.—Production of iron ore in 1925 was 18 per cent more than that in 1924. Pennsylvania is the largest producer of magnetite in the United States; in 1925 it contributed 65 per cent of the total magnetite mined. The largest mine is the Cornwall in Lebanon County. Most of the ore from the Cornwall mine is shipped to Lebanon, Pa., where it is concentrated and sintered before being charged to the blast furnaces. The crude ore shipped to Lebanon in 1925 averaged 40.88 per cent of iron, natural, whereas the iron content of the concentrated ore averaged 57.84 per cent. The magnetite from the French Creek mine, near St. Peters, Chester County, is shipped to Birdsboro, Pa., where it is sintered before it is smelted; the iron content of the sinter produced in 1925 averaged 55.67 per cent. Some bog ore used in gas purification is mined near Falls Creek and other points in northern Pennsylvania, and some carbonate ore for use in paint is mined near Hazards and Little Gap.

OHIO

A deposit of carbonate ore near New Lexington, Perry County, yielded a small output in 1925, and some ore was mined there in 1924. From 1917 to 1923, inclusive, no output of iron ore was reported from Ohio. In 1916 the output was 1,800 tons. Analysis of ore for 1925 is not available but in 1924 the ore shipped from the deposit near New Lexington carried (dry basis, 212° F.) 48.33 per cent of iron, 0.255 per cent of phosphorus, 4.7 per cent of silica, and 0.875 per cent of manganese.

WESTERN STATES

Colorado.—Colorado produces a small amount of brown ore. Production in 1925 showed an increase of 84 per cent. The ore shipped to the furnaces at Pueblo averaged 45.2 per cent of iron, natural.

New Mexico.—The production of iron ore decreased 9 per cent in 1925 The ore mined in New Mexico is magnetite; it is produced near Fierro, Grant County, and is used at the furnaces at Pueblo, Colo. The iron content, natural, of the ore shipped in 1925 averaged 51.9 per cent.

Utah.—An increase of 64 per cent in the production of iron ore represents greater activity at mines in the Iron Springs district, which yielded most of the ore mined in 1925. The ore is chiefly hematite and that shipped from the Iron Springs mine in 1925 averaged 53 per cent of iron, natural The ore from the Desert Mound mine in 1925 was used chiefly for smelter flux. Some ore from a deposit near Eureka, Utah, was shipped to the blast furnace at Provo during 1925; it averaged 52.3 per cent of iron, natural.

Wyoming.—In 1925 the production of iron ore in Wyoming increased 35 per cent. All the ore was hematite; it came from the Sunrise mine, near Hartville, and was shipped to the blast furnaces at Pueblo, Colo. It averaged 56.2 per cent of iron, natural, in 1925.

FOREIGN TRADE IN IRON ORE

IMPORTS AND EXPORTS

The iron ore imported into the United States in 1925 increased 7 per cent in quantity but decreased 35 per cent in total value as compared with 1924. The average value was $3.15 a ton in 1925 and $5.17 in 1924. Chile and Cuba were the chief sources of imports in 1925, these two countries furnishing 76 per cent of the total. The other main sources of imported ore in 1925 were Africa, Spain, and Sweden; 21 per cent of the total came from these countries.

Iron ore imported into the United States, 1923–1925

Country	1923		1924		1925	
	Gross tons	Value	Gross tons	Value	Gross tons	Value
Africa:						
Algeria and Tunisia	345,367	$1,075,289	192,814	$546,803	173,070	$512,563
Portuguese East					3,000	19,834
Australia					140	758
Belgium			12	75	300	1,695
Brazil	70	262	206	3,058	600	7,157
Canada	24,710	97,700	4,122	15,705	7,829	21,547
Chile	634,600	3,704,159	1,144,775	7,479,683	1,113,900	3,221,605
China	2,968	8,809	10	35		
Colombia	19,000	76,000	6,700	20,100		
Cuba	692,979	2,780,131	285,288	1,141,155	546,130	2,074,882
Denmark			7	114		
Dominican Republic			(1)	2		
Egypt	13,000	92,233	900	21,288	9,950	26,632
France	128	2,741	483	11,418	6,345	15,688
Germany	16,013	80,919	12,776	57,070	15,915	61,076
Greece	15,300	23,339	8,000	14,230	17,375	28,046
Italy	1	5				
Japan			5	136		
Kwantung	1	15				
Mexico			(1)	5		
Netherlands	1,067	5,425	2,200	6,692	1,770	5,743
Newfoundland and Labrador	33,240	120,119				
Norway	4,931	32,559	(2)	25		
Spain	214,891	503,258	70,645	179,875	144,421	333,126
Sweden	749,765	2,695,612	317,742	1,074,672	149,238	557,309
United Kingdom	399	9,928	370	8,763	714	7,568
	2,768,430	11,308,503	2,047,055	10,580,904	2,190,697	6,895,229

[1] Less than 1 ton. [2] Not recorded.

Iron ore imported into the United States, 1872–1925

Year	Gross tons	Year	Gross tons
1872–1880	1, 188, 267	1920	1, 273, 456
1881–1890	7, 663, 630	1921	315, 768
1891–1900	5, 869, 757	1922	1, 135, 156
1901–1910	11, 798, 568	1923	2, 768, 430
1911–1915	9, 202, 947	1924	2, 047, 055
1916	1, 325, 736	1925	2, 190, 697
1917	971, 663		
1918	787, 468		49, 015, 059
1919	476, 461		

Exports of iron ore from the United States in 1925 amounted to 630,521 gross tons, valued at $2,411,093, or $3.82 a ton, as compared with 595,413 tons, valued at $2,407,003, or $4.04 a ton, in 1924. These figures represent an increase of 6 per cent in quantity and 0.2 per cent in total value. Except for 120 tons to Germany and 3 tons to United Kingdom, all the ore exported in 1925 went to Canada.

Iron ore exported from the United States, 1899–1925, in gross tons

Year	Quantity	Year	Quantity
1899–1900	92, 125	1920	1, 145, 037
1901–1910	2, 713, 397	1921	440, 106
1911–1915	4, 265, 538	1922	602, 194
1916	1, 183, 952	1923	1, 116, 932
1917	1, 132, 313	1924	595, 413
1918	1, 256, 383	1925	630, 521
1919	996, 569		
			16, 170, 480

IRON-ORE MINING IN CUBA

The iron ore shipped from Cuba to the United States in 1925 amounted to 558,167 gross tons, valued at $1,909,916, as compared with 294,555 tons, valued at $1,145,327, in 1924—an increase of 89 per cent in quantity and of 67 per cent in total value. The average value of the ore was $3.42 a ton in 1925; in 1924 it was $3.89. The shipments in 1925 were 92 per cent of hematite, including a little magnetite, from the Daiquiri and Juragua mines on the southern coast, and 8 per cent of brown ore from the Mayari mines near the northern coast. In 1925 the hematite, dried at 212° F., contained 58.77 per cent of iron, whereas the brown ore carried 52.20 per cent (natural) and 54.07 per cent (nodulized). In 1924 the hematite (dried) averaged 58.57 per cent, whereas the brown ore averaged 52.46 per cent (natural) and 54.25 per cent (nodulized).

The total stock of ore (natural and nodulized) reported on hand at the end of 1925 was 923,431 gross tons, compared with 1,009,963 tons at the end of 1924—a decrease of 9 per cent.

The following table shows the shipments of iron ore from Cuba since the opening of the mines in 1884. The statistics of the shipments of Cuban iron ore are collected by the Bureau of Mines.

Iron ore shipped from mines in the Province of Oriente, Cuba, 1884–1925, in gross tons

Year	Juragua (hematite and magnetite)	Sigua (hematite)	Daiquiri (hematite and a little magnetite)	Mayari (brown ore)	Guama (hematite)	El Cuero (hematite)	Total
1884–1890	1, 142, 519						1, 142, 519
1891–1900	[1] 2, 348, 473	20, 438	[2] 979, 992				3, 348, 903
1901–1910	2, 104, 186		[3] 4, 456, 440	307, 700	41, 241	224, 729	7, 134, 296
1911–1915	1, 567, 112		1, 837, 669	1, 855, 525		532, 194	5, 792, 500
1916	212, 013		181, 602	268, 451		60, 650	712, 716
1917	39, 784		181, 028	287, 904		44, 769	553, 485
1918	17, 128		353, 103	232, 540		40, 761	643, 532
1919			279, 700	78, 080			357, 780
1920	(4)		[4] 561, 268	321, 515			882, 783
1921	(4)		[4] 130, 359				130, 359
1922	(4)		[4] 444, 794				444, 794
1923	(4)		[4] 674, 371				674, 371
1924	(4)		[4] 283, 094	11, 461			294, 555
1925	(4)		[4] 514, 040	44, 127			558, 167
	[4] 7, 431, 215	20, 438	[4] 10, 877, 460	3, 397, 303	41, 241	903, 103	22, 670, 760

[1] Of this quantity, 5,932 tons was sent to Picton, Nova Scotia.
[2] Of this quantity, 51,537 tons was sent to ports outside of the United States.
[3] Of this quantity, 12,691 tons was sent to ports outside of the United States.
[4] Shipments of Juragua mines, 1920–1925, included with Daiquiri mines.

PRODUCTION OF IRON ORE, BY COUNTRIES

The following table, compiled by L. M. Jones, of the Bureau of Mines, shows the production of iron ore by countries for 1921 to 1925, so far as figures are obtainable. Figures for preceding years appear in earlier volumes of Mineral Resources. Complete returns for 1925 are not available, but those for 1924 and earlier years are fairly complete. Thus the figures for 1924 indicate a total world's production of about 130,000,000 metric tons, of which the United States furnished about 42 per cent. In 1923, however, the United States contributed more than one-half of the world's total, which apparently was about 136,000,000 metric tons.

Iron ore produced, 1921–1925, by countries, in metric tons

Country	1921	1922	1923	1924	1925
North America:					
Canada [1]	53, 985	16, 303	27, 904	1, 343	(2)
Cuba [1]	132, 451	451, 933	685, 195	299, 282	567, 126
Mexico	(2)	(2)	50, 694	(2)	46. 000
Newfoundland [1]	522, 456	1, 014, 490	935, 369	665, 633	914, 654
United States	29, 964, 308	47, 884, 940	70, 464, 533	55, 138, 411	62, 901, 620
South America:					
Brazil (exports)			350		30, 000
Chile [3]	48, 393	222, 947	679, 187	987, 969	1, 334, 288
Europe:					
Austria	710, 932	1, 112, 415	1, 211, 065	713, 805	1, 030, 364
Belgium	59, 490	71, 250	117, 090	154, 970	(2)
Czechoslovakia	800, 829	313, 149	675, 185	1, 173, 935	1, 100, 000
Finland		1, 187	1, 000	(2)	226
France	14, 200, 937	21, 106, 112	23, 349, 379	28, 992, 241	35, 741, 195
Germany [4]	5, 790, 331	5, 794, 688	5, 014, 107	4, 284, 799	(2)
Greece	54, 925	49, 272	100, 115	99, 787	(2)
Hungary	36, 015	45, 909	138, 123	101, 750	68, 082
Italy	279, 478	311, 214	340, 831	218, 726	495, 905
Luxemburg	3, 031, 626	4, 488, 974	4, 097, 549	5, 333, 580	6, 672, 092
Norway	54, 975	268, 815	385, 836	522, 124	(2)
Poland	241, 293	352, 531	450, 175	289, 281	211, 987
Portugal	10, 370	18, 292	9, 145	8, 573	2, 000
Rumania	91, 109	94, 607	99, 293	102, 537	(2)
Russia	170, 356	220, 775	493, 376	[5] 930, 939	[5] 2, 097, 700

[1] Shipments.
[2] Data not available.
[3] From Tofo mine.
[4] Exclusive of manganiferous iron ore carrying 12 to 30 per cent of manganese.
[5] Year ended Sept. 30.

Iron ore produced, 1921–1925, by countries, in metric tons—Continued

Country	1921	1922	1923	1924	1925
Europe—Continued.					
Spain	2,602,369	2,771,888	3,456,233	4,612,817	4,442,872
Sweden	6,464,347	6,201,243	5,588,173	6,499,730	8,168,546
Switzerland	28,000	47,000	76,000	[6] 81,375	[2]
United Kingdom [7]	3,526,218	6,946,233	11,049,758	11,227,951	10,305,671
Yugoslavia	16,357	35,645	244,619	330,119	139,137
Asia:					
China	1,270,000	1,371,000	1,401,000	1,100,000	1,200,000
Chosen	242,225	185,560	243,279	309,443	[2]
India	957,204	635,310	834,231	1,468,510	[2]
Japan	19,935	[2]	[2]	[2]	[2]
Unfederated Malay States: Johore	75,442	113,154	156,635	257,181	276,358
Africa:					
Algeria	720,840	1,045,816	1,448,445	1,622,506	1,780,842
Belgian Congo	73,215	71,305	105,756	105,195	87,258
Madagascar	44	24			
Morocco	[8] 115,457	300,084	396,705	[2]	800,000
Tunisia	265,736	496,762	845,000	797,680	724,000
Union of South Africa	2,192	1,913	521		
Oceania:					
Australia—					
New South Wales [9]	181,839	115,152	181,309	147,793	162,181
Queensland	4,126		203		351
South Australia	515,130	52,248	390,604	589,622	596,068
New Zealand	[2]	[2]	[2]	2,550	2,620

[2] Data not available.
[6] Exports.
[7] Exclusive of bog ore, which is used mainly for the purification of gas.
[8] Exports from Melilla.
[9] Includes iron oxide used for paint.

BENEFICIATED IRON ORE

In 1925 the processes reported in use to improve the quality of the ore at the mines were crushing and screening, drying, hand picking, washing, jigging, electromagnetic separation, sintering, nodulizing, and desulphurization by sintering. Some operators combined two or more of these processes. Beneficiation of iron ore was reported at 62 mines in 11 States in 1925 and at 72 mines in 12 States in 1924. Some iron ore is also recovered in the form of dust from blast furnaces, but no statistics on it have been gathered. Ore so recovered was originally included in the statistics of shipments from the mines.

Beneficiated ore shipped from mines in the United States in 1925 increased 23 per cent in quantity and 10 per cent in total value as compared with 1924. Such figures as are available to show the relation between crude ore treated and beneficiated ore recovered indicate that in washing brown ore the ratios, by weight, of crude ore washed to resultant concentrates range from 7 : 1 to 1.25 : 1; in concentrating hematite, from 3.819 : 1 to 1.071 : 1; in concentrating magnetite, from 2.227 : 1 to 1.354 : 1; and in concentrating carbonate, 1.25 : 1.

The quantity of crude ore beneficiated in the Lake Superior district in 1925 amounted to 9,814,448 gross tons, and the beneficiated ore recovered was 6,408,946 tons—a reduction of 3,405,502 tons, and a ratio of 1.531 : 1. In 1924 the crude Lake ore treated amounted to 7,790,428 tons and the beneficiated ore recovered therefrom was 5,172,161 tons—a loss of 2,618,267 tons and a ratio of 1.506 : 1.

Beneficiated iron ore shipped from mines in the United States, 1924–25

[Exclusive of ore containing 5 per cent or more of manganese and of ore sold for paint]

State	Variety	1924		1925	
		Gross tons	Value	Gross tons	Value
Alabama	Hematite, brown ore	751, 774	$2, 004, 161	755, 189	$2, 069, 514
Georgia	Brown ore	59, 754	168, 288	67, 217	204, 480
Michigan	Hematite	24, 946	(1)		
Minnesota	Hematite, magnetite	5, 134, 264	15, 055, 757	6, 410, 362	15, 617, 011
Missouri	Hematite, brown ore	56, 847	315, 622	3, 878	(1)
New Jersey	Magnetite	100, 167	(1)	162, 451	665, 979
New York	do	257, 506	1, 274, 367	393, 299	1, 917, 622
North Carolina	Brown ore	11, 425	30, 081	5, 753	(1)
Pennsylvania	Magnetite	439, 473	(1)	662, 744	(1)
Tennessee	Hematite, brown ore	143, 846	347, 908	138, 432	332, 276
Virginia	Brown ore	22, 895	61, 687	30, 536	(1)
Wisconsin	Hematite, magnetite	[2]89, 642	(1)	105, 811	(1)
Undistributed			2, 452, 421		3, 176, 215
		[2] 7, 092, 539	[2] 21, 710, 292	8, 735, 672	23, 983, 097

[1] Included under "Undistributed." [2] Revised figures.

The next table gives the shipments of beneficiated iron ore beginning with 1914, the first year for which statistics were gathered, and the percentage of beneficiated ore to the total ore shipped. Except for a few years, the increase in the proportion of beneficiated ore has been slow but steady. During the 5-year period 1914 to 1918 the shipments of beneficiated ore averaged 10.6 per cent of the total ore and increased to 13.5 per cent during the next 5-year period (1919 to 1923); since then there has been a fractional increase each year over the average for 1919 to 1923. Minnesota has contributed about 64 per cent of the total shipments of beneficiated ore during the period 1914 to 1925. During the 5-year period 1914 to 1918 an average of 10.2 per cent of the total shipments from Minnesota was beneficiated ore, during the 5-year period 1919 to 1923 the proportion was 14.9 per cent, and in 1924 and 1925 it increased to 16.5 and 16.9 per cent, respectively.

Iron ore shipped from mines in the United States, 1914–1925, in gross tons, and percentage of beneficiated ore to the total shipped

[Exclusive of ore containing 5 per cent or more of manganese and of ore sold for paint]

Year	Beneficiated	Total	Percentage of beneficiated to total	Year	Beneficiated	Total	Percentage of beneficiated to total
1914	4, 130, 298	39, 714, 280	10. 4	1920	8, 514, 838	69, 281, 341	12. 3
1915	5, 581, 029	55, 493, 100	10. 1	1921	3, 727, 021	26, 652, 528	14. 0
1916	8, 105, 011	77, 870, 553	10. 4	1922	6, 623, 144	50, 612, 620	13. 1
1917	8, 166, 564	75, 573, 207	10. 8	1923	10, 686, 992	69, 811, 472	15. 3
1918	7, 881, 570	72, 021, 202	10. 9	1924	[1] 7, 092, 539	52, 083, 375	13. 6
1919	7, 355, 934	56, 372, 784	13. 0	1925	8, 735, 672	63, 924, 763	13. 7

[1] Revised figures.

IRON AND STEEL

The records of the production and sales of iron and steel shown in the following pages are derived in part from producers who report directly to the Bureau of Mines, and in part from several other authoritative sources, such as the American Iron and Steel Institute,

Metal Statistics, the Iron Age, and the Iron Trade Review. The statistics on imports and exports are from the Bureau of Foreign and Domestic Commerce.

PIG IRON

SHIPMENTS, VALUE, AND PRODUCTION, BY STATES

The shipments of pig iron, exclusive of ferro-alloys, reported by the manufacturers to the Bureau of Mines, represent an increase of 19 per cent in quantity and 11 per cent in total value as compared with 1924. The values given represent the approximate amounts received for the iron f. o. b. furnaces and do not include freight costs, selling commissions, and other items that are figured in some of the market prices of pig iron as published in trade journals.

The pig iron shipped includes metal produced from foreign as well as from domestic ore. The pig iron made from ore imported from Africa, Brazil, Chile, Cuba, France, Greece, Russia, Spain, and Sweden, although it constitutes a very small percentage of the total production, amounted in 1925 to 1,436,564 gross tons, valued at $29,558,486, as compared with 1,330,868 tons, valued at $27,539,725, in 1924. In the manufacture during 1925 of 1,404,306 gross tons of pig iron, 2,337,767 gross tons of foreign iron ore is reported to have been used, indicating an average pig-iron yield of 60.07 per cent from imported ore. Domestic ore and 5,137,068 gross tons of cinder, scale, and scrap, amounting in all to 67,166,802 gross tons, were reported used in making 34,720,372 tons of pig iron, indicating an average pig-iron yield of 51.69 per cent from domestic materials. The total production of pig iron, exclusive of ferro-alloys, reported to the Bureau of Mines, was 36,124,678 gross tons, compared with 30,869,199 tons in 1924, an increase of 17 per cent.

Pig iron shipped from blast furnaces in the United States, 1924–25, by States

State	1924		1925		Percentage of increase or decrease	
	Gross tons	Value	Gross tons	Value	Quantity	Value
Alabama	2,667,361	$55,791,228	2,910,370	$57,777,275	+9	+4
Colorado	(1)	(1)	(1)	(1)		
Illinois	2,695,961	59,299,519	3,600,484	74,937,781	+34	+26
Indiana	2,571,411	52,507,720	3,350,747	64,807,575	+30	+23
Kentucky	99,055	(1)	153,935	(1)	+55	
Maryland	539,188	(1)	693,523	(1)	+29	
Massachusetts	50	(1)			−100	−100
Michigan	650,333	15,225,990	831,435	18,452,346	+28	+21
Minnesota	189,033	(1)	276,240	(1)	+46	
Missouri	21,371	(1)	3,758	(1)	−82	
New Jersey	(1)	(1)	(1)	(1)		
New York	1,914,545	38,150,486	2,151,036	40,435,443	+12	+6
Ohio	7,434,487	159,701,131	8,857,615	173,418,068	+19	+9
Pennsylvania	10,962,288	237,052,035	12,537,809	258,140,674	+14	+9
Tennessee	126,660	2,782,154	95,186	2,014,176	−25	−28
Utah	(1)	(1)	126,746	(1)		
Virginia	94,462	2,268,022	97,884	2,237,749	+4	−1
West Virginia	453,944	9,884,019	499,047	9,416,095	+10	−5
Wisconsin	172,435	3,945,369	226,712	4,836,952	+31	+23
Undistributed	[2] 471,545	[2] 28,471,299	[2] 402,175	[2] 32,842,199		
	31,064,129	665,078,972	36,814,702	739,316,333	+19	+11

[1] Included under "Undistributed." [2] Includes figures for States entered as "(1)" above.

Pig iron shipped from blast furnaces in the United States, 1924–25, by grades

Grade	1924			1925		
	Gross tons	Value		Gross tons	Value	
		Total	Average		Total	Average
Charcoal	172,196	$4,596,697	$26.69	186,579	$4,964,071	$26.61
Foundry	5,094,594	107,434,288	21.09	5,434,997	108,843,269	20.03
Basic	16,238,122	339,123,530	20.88	20,192,364	396,133,274	19.62
Bessemer	7,958,929	178,176,837	22.39	8,933,388	186,846,630	20.92
Low-phosphorus	209,941	5,379,655	25.62	207,788	5,031,833	24.22
Malleable	1,042,110	22,234,248	21.34	1,517,573	29,853,240	19.67
Forge	247,545	5,341,975	21.58	231,606	4,827,547	20.84
All other (not ferro-alloys)	100,692	2,791,742	27.73	110,407	2,816,469	25.51
	31,064,129	665,078,972	21.41	36,814,702	739,316,333	20.08

Pig iron shipped from blast furnaces in the United States, 1910–1925

Year	Gross tons	Value	Year	Gross tons	Value
1910	26,674,123	$412,162,486	1918	38,230,440	$1,180,759,565
1911	23,257,288	327,334,624	1919	30,130,231	775,915,043
1912	30,180,969	420,563,388	1920	35,710,227	1,140,904,096
1913	30,388,935	458,342,345	1921	16,038,619	389,437,792
1914	22,263,263	298,777,429	1922	27,670,738	608,144,858
1915	30,384,486	401,409,604	1923	38,361,379	946,799,378
1916	39,126,324	663,478,118	1924	31,064,129	665,078,972
1917	38,612,546	1,053,785,975	1925	36,814,702	739,316,333

The American Iron and Steel Institute reports that in 1925 the output of all kinds of pig iron and ferro-alloys increased 5,294,776 gross tons, or 17 per cent, as compared with 1924.

Pig iron, including ferro-alloys, manufactured in the United States, 1924–25, in gross tons[1]

State	1924	1925	State	1924	1925
Pennsylvania	11,068,979	12,523,485	Missouri		
Ohio	7,415,039	8,862,646	Iowa	463,573	505,217
Illinois	2,600,864	3,604,255	Colorado		
Alabama	2,773,825	2,836,023	Utah		
Indiana	3,350,385	4,119,811	Maryland	558,420	705,377
Michigan			Tennessee	137,991	110,232
New York	2,013,673	2,187,733	Virginia	97,739	125,325
New Jersey					
Wisconsin	357,271	468,479		31,405,790	36,700,566
Minnesota					
West Virginia	568,031	651,983			
Kentucky					

[1] American Iron and Steel Institute.

AVERAGE VALUES

Values at blast furnaces.—The average value of all kinds of pig iron given in the accompanying table is based on reports of the manufacturers to the Bureau of Mines. The figures represent the approximate values f. o. b. at the blast furnaces and do not include the values of ferro-alloys. The general average value for all grades of pig iron at the furnaces, exclusive of ferro-alloys, decreased 6 per cent in 1925 and was the lowest for any year since 1916.

Average value per gross ton of pig iron at blast furnaces in the United States, 1920–1925

State	1920	1921	1922	1923	1924	1925
Alabama	$32.70	$24.33	$19.29	$19.72	$20.92	$19.85
Illinois	28.02	24.50	21.60	25.36	22.00	20.81
Indiana	25.58	22.32	19.65	23.26	20.42	19.34
Kentucky	31.72	28.77	21.05	(1)	(1)	(1)
Michigan	36.22	29.64	24.83	26.25	23.41	22.19
Missouri	45.04	28 19	(1)	(1)	(1)	(1)
New Jersey	38.23	(1)	(1)	(1)	(1)	(1)
New York	37.02	23.15	22.11	23.71	19.93	18.80
Ohio	29.93	24.24	22.17	24.76	21.48	19.58
Pennsylvania	33.27	24.43	22.77	25.02	21.62	20.59
Tennessee	42.55	27.12	21.65	26.95	21.97	21.16
Virginia	41.21	30.24	25.59	26.76	24.01	22.86
West Virginia	32.53	25.29	24.32	24.68	21.77	18.87
Wisconsin	33.98	29.15	23.75	25.90	22.88	21.34
Other States [1]	33.87	25.50	22.11	24.73	21.57	19.83
Average for United States	31.95	24.28	21.98	24.68	21.41	20.08

[1] Included under "Other States."

[2] 1920: Colorado, Connecticut, Maryland, Massachusetts, and Minnesota. 1921: Colorado, Connecticut, Maryland, Massachusetts, Minnesota, and New Jersey. 1922: Colorado, Connecticut, Maryland, Massachusetts, Minnesota, Missouri, and New Jersey. 1923: Colorado, Kentucky, Maryland, Massachusetts, Minnesota, Missouri, and New Jersey. 1924: Colorado, Kentucky, Maryland, Massachusetts, Minnesota, Missouri, New Jersey, and Utah. 1925: Colorado, Kentucky, Maryland, Minnesota, Missouri, New Jersey, and Utah.

Average value per gross ton of pig iron at blast furnaces in the United States, 1889–1925

Year	Value	Year	Value
1889	$15.78	1908	$15.96
1890	16.43	1909	16.25
1891	15.50	1910	15.45
1892	14.32	1911	14.07
1893	11.90	1912	13.93
1894	9.76	1913	15.08
1895	11.14	1914	13.42
1896	10.47	1915	13.21
1897	9.85	1916	16.96
1898	9.90	1917	27.29
1899	18.00	1918	30.89
1900	18.85	1919	25.75
1901	15.25	1920	31.95
1902	20.92	1921	24.28
1903	19.12	1922	21.98
1904	14.13	1923	24.68
1905	16.63	1924	21.41
1906	19.98	1925	20.08
1907	20.56		

Commercial quotations.—The average monthly prices, according to published market quotations, of the chief grades of pig iron at the blast furnaces or at the nearest market during 1924 and 1925 are summarized in the following table for comparison with preceding tables giving the figures reported by blast-furnace operators. The average commercial quotations for each of the four grades of iron show a decrease and are lower than the average values reported by manufacturers, but the reader should remember that the manufacturers' values represent weighted averages of what was actually received for the metal, and a discrepancy between the two sets of figures is to be expected.

Average monthly prices per ton of chief grades of pig iron, 1924–25 [1]

Month	Foundry pig iron at Valley furnaces		Foundry pig iron at Birmingham furnaces		Bessemer pig iron at Valley furnaces		Basic pig iron at Valley furnaces	
	1924	1925	1924	1925	1924	1925	1924	1925
January	$22.12	$22.00	$21.27	$20.00	$23.00	$22.73	$21.12	$21.73
February	23.20	22.00	22.52	20.00	23.72	22.71	22.62	21.94
March	23.00	21.15	22.50	20.25	23.29	22.23	22.00	21.12
April	22.04	20.50	22.35	19.89	22.87	21.38	21.54	20.25
May	21.15	19.40	21.46	19.88	22.25	20.26	20.73	19.26
June	19.72	18.35	19.88	18.38	21.32	19.12	19.48	18.12
July	19.00	18.50	17.75	17.33	20.27	19.00	19.00	18.00
August	19.23	18.50	17.50	18.06	20.00	19.00	19.00	18.00
September	19.92	18.74	17.50	18.58	20.00	19.24	19.00	18.24
October	19.50	19.07	17.50	19.41	20.00	19.57	19.00	18.57
November	19.44	20.32	17.81	21.00	20.17	20.82	18.85	19.82
December	21.10	20.50	19.71	22.00	21.58	21.00	20.40	20.00
Average	20.79	19.92	19.81	19.57	21.54	20.59	20.23	19.59

[1] Metal Statistics, 1926.

PRODUCTION BY GRADES AND BY FUEL USED, TOTAL PRODUCTION, AND BLAST FURNACES

The statistics of production of pig iron by grades and by fuel used for 1921 to 1925, the total production of pig iron, and the number of furnaces in blast in 1924 and 1925 have been published by the American Iron and Steel Institute as follows. These figures include ferro-alloys. Metals produced by the use of electricity and by the use of coke and electricity together are included in coke pig iron.

Pig iron manufactured in the United States, 1921–1925, by grades, in gross tons

Grade	1921	1922	1923	1924	1925
Bessemer and low-phosphorus	5,595,215	7,813,203	11,677,509	8,172,297	9,419,461
Basic	7,753,071	13,841,367	19,795,590	15,999,012	19,667,380
Forge	112,748	214,210	327,430	255,961	240,652
Foundry and ferrosilicon	2,568,136	3,976,431	6,470,013	5,623,124	5,410,217
Malleable	457,340	1,051,495	1,571,064	973,158	1,553,636
Spiegeleisen	56,423	73,443	129,686	107,066	325,784
Ferromanganese	103,755	150,115	247,031	194,243	
White, mottled, direct castings, etc	41,438	99,640	142,823	80,929	83,436
	16,688,126	27,219,904	40,361,146	31,405,790	36,700,566

Pig iron manufactured in the United States, 1921–1925, by fuel used, in gross tons

Fuel used	1921	1922	1923	1924	1925
Bituminous, chiefly coke	16,579,653	26,995,173	40,097,239	31,193,080	36,504,402
Anthracite and coke	13,743		12,730		
Charcoal	94,730	224,731	251,177	212,710	196,164
	16,688,126	27,219,904	40,361,146	31,405,790	36,700,566

The next table shows the production in the United States of pig iron, including ferro-alloys, so far as it has been recorded. Statistics by years prior to 1916 will be found in Mineral Resources for 1918 and earlier years.

Pig iron manufactured in the United States, 1810–1925

Year	Gross tons	Year	Gross tons
1810–1860	10, 542, 548	1919	31, 015, 364
1861–1870	11, 366, 963	1920	36, 925, 987
1871–1880	24, 055, 278	1921	16, 688, 126
1881–1890	56, 902, 041	1922	27, 219, 904
1891–1900	98, 124, 754	1923	40, 361, 146
1901–1910	211, 321, 934	1924	31, 405, 790
1911–1915	137, 591, 093	1925	36, 700, 566
1916	39, 434, 797		
1917	38, 621, 216		887, 332, 151
1918	39, 054, 644		

The number of furnaces in blast on June 30 and December 31 and the total number of stacks recorded for 1924 and 1925, exclusive of electric reduction furnaces, are as follows:

Blast furnaces in the United States, 1924 and 1925

State	In blast June 30, 1924	Dec. 31, 1924			In blast June 30, 1925	Dec. 31, 1925		
		In	Out	Total		In	Out	Total
Pennsylvania	55	87	59	146	60	84	51	135
Ohio	30	49	28	77	46	48	21	69
Illinois	8	18	8	26	15	16	9	25
Alabama	24	23	19	42	24	27	11	38
New York	9	15	12	27	10	17	10	27
Virginia	1	3	14	17	2	1	16	17
Tennessee	3	2	13	15	2	3	11	14
Colorado	3	2	3	5	3	3	2	5
Missouri	1		3	3			3	3
Utah	1	1		1	1	1		1
Maryland	2	5	1	6	4	5	1	6
New Jersey			4	4			4	4
Wisconsin	2	1	6	7	1	2	4	6
Minnesota	1	1	2	3	2	2	1	3
Indiana	10	14	2	16	14	16	1	17
Michigan	10	10	3	13	10	9	3	12
West Virginia	3	3	1	4	3	2	2	4
Kentucky	1	1	6	7	1	2	5	7
Georgia			1	1				
Texas			1	1			1	1
Mississippi			1	1			1	1
Connecticut			2	2				
Massachusetts			1	1				
	164	235	190	425	198	238	157	395

FOREIGN TRADE IN PIG IRON

The pig iron imported into the United States during 1925 increased 111 per cent in quantity and 113 per cent in total value, as compared with 1924. In both years India was the chief source of the imported pig iron. In 1925 the imports from India increased 158 per cent, those from Germany 568 per cent, those from the United Kingdom 69 per cent, and those from the Netherlands 130 per cent.

Pig iron, including kentledge, ferromanganese, ferrosilicon, and spiegeleisen, 1921, and pig iron, 1922–1925, imported into the United States, by countries, in gross tons [1]

Country	1921	1922	1923	1924	1925
North America:					
Canada	9,651	17,836	54,076	15,933	6 455
Dominican Republic					3
Honduras				200	
Mexico			1		
Newfoundland and Labrador	13				
Panama		141			
Europe:					
Austria			299		
Belgium	12,004	64,449	14,980	3,019	11,068
France	127	41,704	57,722	23,208	9,814
Germany	3,508	4,085	20,740	11,228	75,052
Ireland				50	
Netherlands		2,537		23,857	54,904
Sweden	1,088	408	705	700	2,169
Switzerland	10				
United Kingdom—					
England	9,302	152,833	179,937	52,593	96,869
Scotland		98,950	18,201	4,546	
Asia:					
China	4,610	502	3,129	2,375	200
Hongkong	250				
India (British)			17,988	71,370	184,325
Japan	2,002				[2]
Kwantung	1,213			30	566
Oceania: Australia	258				
	44,036	383,445	367,778	209,109	441,425
Value	$2,014,926	$8,670,860	$9,005,077	$3,741,213	$7,951,283

[1] Separate figures for pig iron not available prior to 1922. [2] Less than 1 ton.

Pig iron [1] imported into the United States, 1916–1925

Year	Gross tons	Value	Year	Gross tons	Value
1916 [1]	135,349	$10,239,868	1921 [1]	44,036	$2,014,926
1917 [1]	76,786	7,872,105	1922	383,445	8,670,860
1918 [1]	34,711	4,968,056	1923	367,778	9,005,077
1919 [1]	101,665	6,565,106	1924	209,109	3,741,213
1920 [1]	185,944	12,801,834	1925	441,425	7,951,283

[1] Figures for 1916 to 1921, inclusive, include ferro-alloys. Separate data not available prior to 1922.

The exports of pig iron from the United States decreased 21 per cent in quantity and 24 per cent in total value in 1925, as compared with 1924. Canada was the best customer in 1925, taking 61 per cent of the total exports. The average value was $22.18 a ton in 1925, as compared with $23.09 in 1924.

Pig iron exported from the United States, 1924–25, by countries, in gross tons

Country	1924	1925	Country	1924	1925
North America:			Europe—Continued		
Canada	25,010	20,081	Germany	715	680
Cuba	610	357	Italy		11
Mexico	987	387	Norway	45	10
Panama	693	383	United Kingdom—		
Other countries	106	161	England	9,778	8,209
South America:			Scotland	99	
Argentina	32		Asia:		
Brazil	123		China		65
Chile		456	Japan	62	105
Colombia	422	424	Java and Madura		39
Peru	279	206	Philippine Islands	55	662
Other countries	95	37	Other countries	2	
Europe:				41,483	32,674
Austria	34		Value	$957,921	$724,565
Belgium	2,276	391			
France	60	10			

Pig iron [1] exported from the United States, 1916–1925

Year	Gross tons	Value	Year	Gross tons	Value
1916 [1]	607, 236	$15, 381, 431	1921 [1]	28, 307	$933, 093
1917 [1]	656, 220	24, 037, 051	1922	30, 920	756, 842
1918 [1]	269, 575	11, 576, 721	1923	32, 318	862, 443
1919 [1]	321, 261	12, 313, 183	1924	41, 483	957, 921
1920 [1]	216, 828	10, 074, 377	1925	32, 674	724, 565

[1] Figures for 1916 to 1921, inclusive, include ferro-alloys. Separate data not available prior to 1922.

PRODUCTION BY COUNTRIES

The accompanying table, compiled by L. M. Jones of the Bureau of Mines, shows the predominance of the United States in the manufacture of pig iron, and with the table giving exports from the United States indicates that the consumption in the principal European countries is still comparatively small.

Pig iron (including ferro-alloys) produced, 1921–1925, by countries, in metric tons

Country	1921	1922	1923	1924	1925
Australia	358, 020	84, 874	335, 096	422, 728	446, 472
Austria	224, 031	320, 928	341, 875	266, 463	379, 921
Belgium	872, 010	1, 497, 610	2, 147, 950	2, 843, 920	2, 541, 430
Brazil	17, 700	(1)	[2] 70, 000	[2] 70, 000	[2] 70, 000
Canada	626, 199	410, 192	923, 362	629, 386	605, 674
China	460, 000	560, 000	520, 000	480, 000	(1)
Chosen	83, 273	83, 221	99, 933	99, 795	(1)
Czechoslovakia	576, 594	334, 837	817, 050	983, 042	1, 299, 500
Finland	7, 080	13, 072	9, 257	10, 678	5, 360
France	3, 446, 799	5, 276, 982	5, 467, 872	7, 700, 000	8, 473, 100
Germany	7, 854, 770	[3] 9, 194, 517	[3] 4, 940, 505	[3] 7, 832, 554	[3] 10, 179, 400
Saar	(4)	1, 156, 000	1, 021, 000	1, 390, 000	1, 452, 300
Hungary	51, 000	117, 000	124, 445	115, 502	93, 283
India	404, 673	374, 336	655, 221	923, 125	(1)
Italy	74, 762	175, 852	269, 166	341, 317	536, 245
Japan	96, 648	77, 265	89, 643	75, 241	(1)
Luxemburg	970, 336	1, 679, 328	1, 406, 666	2, 157, 170	2, 363, 253
Mexico	41, 540	23, 769	21, 210	(1)	38, 000
New Zealand	(1)	82	(1)	640	1, 310
Norway	2, 509	3, 759	26, 395	64, 955	(1)
Philippine Islands	174	156	269	273	398
Poland	60, 443	273, 516	547, 288	335, 850	314, 564
Rumania	33, 362	31, 419	39, 102	46, 081	60, 000
Russia [5]	122, 853	166, 828	155, 000	664, 648	1, 303, 611
Spain	347, 497	209, 792	400, 270	497, 390	528, 237
Sweden	320, 037	275, 441	301, 619	535, 361	425, 000
Union of South Africa	1, 041				
United Kingdom	2, 658, 292	4, 980, 982	7, 559, 920	7, 436, 368	6, 336, 300
United States	16, 955, 970	27, 656, 783	41, 008, 942	31, 909, 853	37, 289, 610
Yugoslavia	11, 881	15, 348	26, 361	15, 019	(1)

[1] Data not available.
[2] Official estimate of annual production.
[3] Exclusive of the Saar.
[4] Included with Germany.
[5] Year ended Sept. 30.

FERRO-ALLOYS

PRODUCTION, SHIPMENTS, VALUE, AND PRICES

In these reports the statistics on the output of ferro-alloys in the United States are separated from those of pig iron in order that the values given may be more nearly accurate. Although the quantity of ferro-alloys is relatively small, the values per ton are so high that failure to separate the figures would unduly increase the apparent average value of the pig iron.

The shipments of ferro-alloys of all classes in 1925 increased 24 per cent in quantity and 23 per cent in total value as compared with 1924. The production of ferro-alloys in 1924 was 517,800 gross tons; in 1925 it was 575,455 tons, an increase of 11 per cent. Ferro-alloys were made in 1925 at 12 blast furnaces, 14 electric furnaces, and 2 alumino-thermic plants; in addition, 2 plants made ferrosilicon and 1 plant made ferrophosphorus as a by-product.

Ferromanganese.—The shipments of ferromanganese in 1925, including a little silicomanganese, amounted to 254,005 gross tons, an increase of 9 per cent over 1924. The average value per ton f. o. b. furnaces reported for ferromanganese (exclusive of silicomanganese) was $101.78 in 1925, compared with $100.87 in 1924.

In 1925 ferromanganese was made at 8 furnaces by 3 producers; in 1924 it was made at 11 furnaces by 5 producers.

The production of ferromanganese in 1925 was 259,780 gross tons, averaging 78.93 per cent of manganese, and containing 205,046 tons of manganese (metal). In the production of ferromanganese in 1925 there were used 519,139 gross tons of foreign manganese ore, 34,942 tons of domestic manganese ore, 4,949 tons of iron ore, and 11,072 tons of cinder, scale, and scrap. The quantity of manganese ore used per ton of ferromanganese made in 1925 was 2.133 gross tons; in 1924 it was 2.186 tons; and in 1923 it was 2.243 tons. Of the foreign manganese ore consumed in 1925, 207,238 tons was from Brazil and averaged 43.52 per cent of manganese; Russia furnished 194,006 tons, averaging 48.17 per cent of manganese; India, 68,326 tons, averaging 50.42 per cent; and Africa, 33,582 tons, averaging 46.97 per cent. The remainder was from Chile, China, Cuba, and Porto Rico and averaged between 42.44 and 52.75 per cent of manganese. The average manganese content of the total foreign ore consumed in in 1925 was 46.41 per cent. The improvement in metallurgy in the manufacture of ferromanganese is evidenced by the recovery of 80.44 per cent of the metallic manganese contained in all ore consumed in 1925, whereas 10 to 40 per cent of the manganese in the ore was lost in making ferromanganese in 1918.

Manganese ore and other metallic materials consumed and ferromanganese produced in the United States, 1921–1925

Year	Materials consumed (gross tons)				Ferromanganese produced			Manganese ore used per ton of ferromanganese made (gross tons)
	Manganese ore		Iron ore	Cinder, scale, and scrap	Gross tons	Manganese contained		
	Foreign	Domestic				Per cent	Gross tons	
1921	208,376	17,839	143	2,092	104,129	76.17	79,319	2.172
1922	335,165	1,804	----------	5,252	150,010	78.55	117,836	2.246
1923	538,280	26,790	489	6,945	251,938	78.13	196,844	2.243
1924	443,260	20,133	909	4,434	211,965	78.21	165,776	2.186
1925	519,139	34,942	4,949	11,072	259,780	78.93	205,046	2.133

Manganese ore used in the manufacture of ferromanganese in the United States in 1925, by sources of ore

Source of ore	Ore (gross tons)	Manganese contained	
		Per cent	Gross tons
Africa	33,582	46.97	15,775
Brazil	207,238	43.52	90,194
Chile	2,062	48.11	992
China	606	52.75	320
Cuba	10,543	43.12	4,546
India	68,326	50.42	34,447
Porto Rico	2,776	42.44	1,178
Russia	194,006	48.17	93,455
	519,139	46.41	240,907
United States	34,942	40.07	14,001
	554,081	46.01	254,908

Spiegeleisen.—The shipments of spiegeleisen in 1925, amounting to 95,890 gross tons, were 26 per cent larger than in 1924. The average value per ton at the furnaces in 1925 was $25.10; in 1924 it was $30.91.

Spiegeleisen was made at 2 furnaces by 2 producers in 1925 and at 6 furnaces by 4 producers in 1924.

The production of spiegeleisen in 1925 was 65,759 gross tons, averaging about 19 per cent of manganese, and containing 12,491 tons of manganese (metal). In the production of spiegeleisen in 1925 there were used 120,834 tons of zinc residuum which contained about 13 per cent of manganese and 42 per cent of iron, 150 tons of manganese and manganiferous ores, and 1,994 tons of scrap. The quantity of these materials used per ton of spiegeleisen made in 1925 was 1.87 tons; in 1924 it was 1.919 tons; and in 1923 it was 1.892 tons.

Ferrosilicon.—The ferrosilicon produced in 1925 amounted to 207,818 gross tons, compared with 162,535 tons in 1924, an increase of 28 per cent. Of the ferrosilicon produced in 1925, nearly 46 per cent was made by the blast-furnace process, 54 per cent by the electric-furnace process, and a little as a by-product of electric furnaces in the manufacture of artificial abrasives. The shipments of ferrosilicon in 1925, amounting to 221,387 gross tons, were 48 per cent more than in 1924.

Ferromolybdenum.—The production of ferromolybdenum and calcium molybdate in 1925 was 191 gross tons, averaging 37.63 per cent of molybdenum, and containing 160,826 pounds of molybdenum (metal). Ferromolybdenum and calcium molybdate were made at 3 electric furnaces by 3 producers in both 1925 and 1924. The molybdenum ore used in making ferromolybdenum and calcium molybdate was mined in Colorado and New Mexico.

The shipments of ferromolybdenum and calcium molybdate in 1925, amounting to 210 gross tons, contained 186,157 pounds of molybdenum, and the average value per pound of the contained molybdenum (f. o. b. furnaces) was $1.27, compared with $1.85 in 1924.

An important development in the molybdenum industry in 1925, according to Cutter,[6] was the virtually complete disappearance of ferromolybdenum from the market and the substitution of calcium molybdate as the furnace addition by virtually the entire alloy steel industry. This change began during the latter part of 1924 and became complete early in 1925. Calcium molybdate is not only easier and less costly to produce but it introduces the molybdenum into the steel bath in a much purer form, and steels made in this way are claimed to be superior to those made with ferromolybdenum.

Ferrotungsten.—The production of ferrotungsten in 1925 was 1,128 gross tons, averaging 76.28 per cent of tungsten, and containing 1,926,835 pounds of tungsten (metal). Ferrotungsten was made at 5 furnaces—4 electric and 1 alumino-thermic—by 5 producers in 1925 and at 7 furnaces by 7 producers in 1924. The greater part of the ferrotungsten produced in 1925 was made from foreign ores, chiefly from China and Burma. The domestic ores used came mostly from California and Nevada, but a little ore from Arizona and Colorado was also used.

The shipments of ferrotungsten in 1925, amounting to 1,238 gross tons, contained 2,134,132 pounds of tungsten, and the average value per pound of contained tungsten was 93 cents f. o. b. furnaces, compared with 90 cents in 1924.

Ferrovanadium.—The ferrovanadium produced in 1925 amounted to 1,331 gross tons; it averaged 35.39 per cent of vanadium and contained 1,055,035 pounds of vanadium (metal). Ferrovanadium was made at 4 furnaces—3 electric and 1 alumino-thermic—by 4 producers in both 1925 and 1924. The ferrovanadium produced in 1925 was made chiefly from Peruvian ore. Some vanadic acid made from carnotite and roscoelite mined in Colorado and Utah was also used.

The shipments of ferrovanadium in 1925 were 1,841 gross tons, which contained 1,465,825 pounds of vanadium and were valued at the furnaces at an average of $3.30 per pound of contained vanadium, as compared with $3.40 in 1924.

Ferro-alloys shipped from furnaces in the United States, 1924–25, by varieties

Variety of alloy	1924		1925	
	Gross tons	Value	Gross tons	Value
Ferromanganese [a]	232,821	$23,533,668	254,005	$26,006,439
Spiegeleisen	76,179	2,354,731	95,890	2,407,226
Ferrosilicon (7 per cent or more silicon)	150,021	7,558,984	221,387	11,405,060
Ferromolybdenum	107	254,970	210	236,957
Ferrotungsten	741	1,110,553	1,238	1,991,123
Ferrovanadium	1,355	3,641,724	1,841	4,843,635
Other varieties [b]	36,020	4,795,318	41,651	6,157,660
	497,244	43,249,948	616,222	53,048,100

[a] Includes a small quantity of silicomanganese.

[b] 1924: Ferrochromium, ferrophosphorus, ferrotitanium, ferrozirconium, and zirconium-ferrosilicon; 1925: Ferrochromium, ferrophosphorus, ferrotitanium, ferrouranium, ferrozirconium, and zirconium-ferrosilicon.

[6] Cutter, J. D., "Molybdenum:" Eng. and Min. Jour.-Press, vol. 121, Jan. 16, 1926, p. 91.

Ferro-alloys shipped from furnaces in the United States, 1916–1925, in gross tons [1]

Year	Ferro-manganese	Spiegel-eisen	Other varieties	Total	
				Quantity	Value
1916 [1]	224,103	182,837	182,798	589,738	$50,281,692
1917 [1]	260,225	189,241	184,555	634,021	83,731,724
1918 [1]	366,076	263,861	180,931	750,868	115,433,943
1919	198,255	90,855	130,528	419,638	53,730,964
1920	276,594	103,672	232,542	612,808	77,519,367
1921	111,374	69,230	68,023	248,627	21,697,785
1922	161,612	70,253	191,415	423,280	28,259,004
1923	226,365	134,086	219,366	579,817	49,877,231
1924	232,821	76,179	188,244	497,244	43,249,948
1925	254,005	95,890	266,327	616,222	53,048,100

[1] The figures for 1916 to 1918, inclusive, fall short of the actual production of the United States, as the output of certain electrically produced ferro-alloys is not available for publication.

The following records of average contract prices of ferromanganese and of spiegeleisen, by months, for the last four years, show a wide range. The ferromanganese prices are quoted for material "delivered at Pittsburgh"; those of spiegeleisen are prices at producers' furnaces.

Quoted prices per ton of ferromanganese and spiegeleisen, 1922–1925 [1]

Month	Ferromanganese (delivered at Pittsburgh)				Spiegeleisen (at producers' furnaces)			
	1922	1923	1924	1925	1922	1923	1924	1925
January	$61.90	$109.79	$113.79	$116.79	$25.50	$34.90	$39.00	$32.00
February	65.32	112.29	112.29	119.79	28.00	35.75	39.00	33.00
March	67.82	120.79	112.29	119.79	28.00	37.25	38.00	33.00
April	69.07	124.79	112.29	119.79	30.00	39.25	36.00	33.00
May	72.32	129.79	112.29	119.79	35.00	43.00	36.75	33.00
June	72.82	129.79	112.29	119.79	35.25	46.00	36.00	32.00
July	72.29	122.29	110.79	119.79	35.00	45.00	35.00	31.50
August	72.29	122.29	98.79	119.79	37.00	45.00	32.50	32.25
September	80.59	114.79	97.79	119.79	38.00	43.50	32.00	33.00
October	105.47	112.79	104.79	119.79	37.75	40.00	31.00	33.00
November	104.92	113.79	107.29	119.79	36.80	39.00	31.75	34.00
December	104.92	113.79	109.79	119.79	35.50	38.00	31.00	34.00

[1] Iron Trade Review.

IMPORTS AND EXPORTS

The imports of the alloys of the rarer metals are not all reported separately, but are grouped as shown in the next table. Ferromanganese constituted the bulk of the imports; most of it came from England.

Prior to the date the new tariff went into effect (September 22, 1922), the Bureau of Foreign and Domestic Commerce recorded only the gross weight of the ferro-alloy imported. Since that date the import statistics are not uniform, the gross weight of some ferro-alloys and the contained rarer metal of others being recorded. The reader should bear this change in mind when comparing the quantities in the two following tables with quantities published before the new tariff became effective. The values, however, are comparable.

The exports of ferro-alloys are relatively unimportant. Ferromanganese and spiegeleisen, each of which increased 74 per cent in quantity and value, constituted the greater part of the exports in 1925.

Ferro-alloys and ferro-alloy metals imported for consumption in the United States, 1924–25, by varieties

Variety of alloy	1924		1925	
	Gross tons	Value	Gross tons	Value
Ferromanganese (manganese content)	45,270	$3,844,474	62,970	$6,033,147
Spiegeleisen	7,433	235,566	1,090	39,841
Ferrochrome and chromium:				
Ferrochrome—				
Containing 3 per cent or more carbon (chromium content)	30	5,312	69	11,405
Containing less than 3 per cent carbon	436	114,879	588	129,510
Chrome or chromium metal	2	3,595	3	4,769
Chromium vanadium			32	5,065
Ferrosilicon (silicon content)	12,125	1,249,071	4,556	585,193
Molybdenum and ferromolybdenum (molybdenum content)	[1]	802	[2]	1,184
Titanium and ferrotitanium	13	5,927	17	6,698
Tungsten and ferrotungsten (tungsten content)	63	49,394	375	316,806
		5,509,020		7,133,618

[1] 431 pounds. [2] 274 pounds.

Ferromanganese and ferrosilicon imported into the United States, 1924–25, by countries

[General imports]

Country	Ferromanganese (manganese content)				Ferrosilicon (silicon content)			
	1924		1925		1924		1925	
	Gross tons	Value	Gross tons	Value	Gross tons	Value	Gross tons	Value
Belgium							49	$4,663
Canada	216	$29,478	7,838	$1,092,943	9,779	$1,030,957	4,201	547,274
Chile			117	17,813	12	5,371		
China					50	6,856		
France	166	30,894	201	40,907	13	1,594		
Germany	114	16,297	2,194	210,404	3	418		
India (British)	103	7,006	94	6,701				
Italy			19	2,872				
Netherlands	79	6,445	199	19,108				
Norway	10,277	662,365	8,478	733,717	1,624	144,121	197	21,745
Sweden			3,162	316,901	487	42,222	97	10,053
Switzerland					23	3,072		
Turkey in Europe			484	47,093				
United Kingdom	36,856	3,302,206	45,291	4,089,861			12	1,458
	47,811	4,054,691	68,077	6,578,320	11,991	1,234,611	4,556	585,193

Ferro-alloys and ferro-alloy metals exported from the United States, 1923–1925, by varieties

Variety of alloy	1923		1924		1925	
	Gross tons	Value	Gross tons	Value	Gross tons	Value
Ferromanganese [1]	4,295	$151,224	3,165	$92,421	5,496	$160,568
Spiegeleisen [1]						
Ferrosilicon	814	31,154	775	29,214	[1]	[1]
Tungsten and ferrotungsten (including tungsten wire)	2	122,906	2	114,775	6	143,987
Ferrovanadium	23	64,713	25	81,016	46	106,754

[1] Not separately classified.

STEEL

PRODUCTION

The following tables showing the production of steel were compiled by the American Iron and Steel Institute. No data whatever are available on the value of the output of crude steel at the mills, but the weekly issues and annual statistical reviews of the Iron Age give market quotations of prices of steel billets and some of the leading forms of finished steel. The price of Bessemer steel billets at Pittsburgh in 1925 ranged from $34.25 to $37 a gross ton; in 1924 it ranged from $35.50 to $40. Tank plates at Pittsburgh ranged from 1.8 to 2 cents a pound in 1925 and from 1.8 to 2.5 cents a pound in 1924. Structural shapes at Pittsburgh ranged from 1.9 to 2.1 cents a pound in 1925 and from 1.93 to 2.5 cents in 1924.

Bessemer steel ingots and castings manufactured in the United States, 1921–1925, by States, in gross tons

State	1921	1922	1923	1924	1925
Ohio	1,581,610	2,324,425	3,557,579	2,557,689	2,963,590
Pennsylvania	1,665,456	2,474,956	3,115,840	2,210,868	2,354,231
Illinois	532,539	707,067	1,057,576	598,442	740,212
Other States	236,333	412,850	753,093	532,591	665,929
	4,015,938	5,919,298	8,484,088	5,899,590	6,723,962

Open-hearth steel ingots and castings manufactured in the United States, 1921–1925, by States, in gross tons

State	1921	1922	1923	1924	1925
New England States	102,642	204,343	268,630	252,273	296,091
New York and New Jersey	634,290	1,597,881	1,951,278	1,424,677	1,724,720
Pennsylvania	6,408,043	11,583,812	14,428,187	12,243,713	14,021,750
Ohio	3,108,332	6,770,293	7,786,820	7,119,786	8,799,951
Indiana	2,308,414	3,571,397	4,326,724	3,990,165	4,978,558
Illinois	1,093,268	2,077,920	2,579,095	2,184,068	2,817,027
Other States	1,934,813	3,503,337	4,558,923	4,362,668	5,396,391
	15,589,802	29,308,983	35,899,657	31,577,350	38,034,488

According to these tables there were increases of 14 per cent in the production of Bessemer steel and of 20 per cent in open-hearth steel in 1925, compared with 1924. The total production of steel increased 20 per cent. Of the total output in 1925, 84 per cent was represented by open-hearth steel, 15 per cent by Bessemer steel, and a little more than 1 per cent by all other classes of steel.

Of the total output of open-hearth steel, 37,087,342 gross tons were made by the basic process and 947,146 tons by the acid process, compared with 30,719,523 tons of basic steel and 857,827 tons of acid steel in 1924.

The production of steel by the electric process in 1925 showed an increase of 42 per cent as compared with 1924.

Steel electrically manufactured in the United States, 1909–1925, in gross tons

Year	Ingots	Castings	Total	Year	Ingots	Castings	Total
1909	13,456	306	13,762	1918	403,068	108,296	511,364
1910	50,821	1,320	52,141	1919	272,942	111,510	384,452
1911	27,227	1,878	29,105	1920	346,956	155,196	502,152
1912	14,147	4,162	18,309	1921	84,404	85,095	169,499
1913	20,973	9,207	30,180	1922	191,057	154,982	346,039
1914	15,458	8,551	24,009	1923	279,914	235,958	515,872
1915	46,348	23,064	69,412	1924	225,977	206,549	432,526
1916	126,048	42,870	168,918	1925	335,978	279,534	615,512
1917	239,632	64,911	304,543				

Figures for the total production of electric steel in 1925 include 293,780 tons of alloy-steel ingots and castings that were alloyed with nickel, vanadium, tungsten, chromium, molybdenum, and other metals (249,374 tons of ingots and 44,406 tons of castings), compared with 188,563 tons (159,742 tons of ingots and 28,821 tons of castings) so alloyed in 1924.

On December 31, 1925, the number of completed plants equipped for the manufacture of steel by the electric process was 213, as compared with 206 plants at the end of 1924.

Steel produced in the United States, 1810–1925, in gross tons

Year	Bessemer	Open-hearth	Crucible	Other steel	Total
1810–1870	58,482	2,232	146,370		207,084
1871	40,179	1,785	31,250		73,214
1872–1880	4,293,896	245,035	349,730	76,009	4,964,670
1881–1890	21,596,699	2,387,925	703,489	37,044	24,725,157
1891–1900	49,387,341	15,392,764	762,446	35,820	65,578,371
1901–1910	94,048,698	92,418,814	1,051,379	154,683	187,673,574
1911–1915	42,329,520	98,833,090	544,047	185,692	141,892,349
1916	11,059,039	31,415,427	129,692	169,522	42,773,680
1917	10,479,960	34,148,893	126,716	305,038	45,060,607
1918	9,376,236	34,459,391	115,112	511,693	44,462,432
1919	7,271,562	26,948,694	63,572	387,404	34,671,232
1920	8,883,087	32,671,895	72,265	505,687	42,132,934
1921	4,015,938	15,589,802	7,613	170,444	19,783,797
1922	5,919,298	29,308,983	28,606	346,039	35,602,926
1923	8,484,088	35,899,657	44,079	515,872	44,943,696
1924	5,899,590	31,577,350	22,473	432,526	37,931,939
1925	6,723,962	38,034,488	19,562	615,512	45,393,524

FOREIGN TRADE IN STEEL

The following tables show the imports and exports of certain iron and steel products:

Iron and steel imported into the United States, 1923–1925

Article	1923		1924		1925	
	Gross tons	Value	Gross tons	Value	Gross tons	Value
Bar iron	7,754	$451,508	4,325	$262,164	11,740	$538,488
Boiler and other plate of iron and steel	1,818	91,478	3,276	125,705	818	50,014
Iron and steel scrap	162,068	2,783,406	66,841	1,026,277	99,815	1,361,342
Rails for railways	29,706	963,142	43,358	1,313,041	36,872	1,050,578
Sheets of iron or steel, skelp, saw plates and steel, n.e.s	2,754	316,538	2,789	200,235	3,662	292,155
Steel ingots, bars, etc	22,671	2,371,886	39,024	3,074,303	27,081	1,768,784
Tin and terne plates	10,037	1,166,790	1,036	157,659	382	107,624
Wire and articles made from wire		3,562,923		6,130,604		4,611,333
Wire rods	3,948	312,899	6,851	460,367	7,988	539,241
All other manufactures of iron and steel (not specially provided for)		2,813,579		2,264,462		2,244,852

Iron and steel exported from the United States, 1923–1925

Article	1923		1924		1925	
	Gross tons	Value	Gross tons	Value	Gross tons	Value
Axes		$1,174,897		$1,569,024		$1,340,631
Bars or rods (of steel):						
Wire	40,868	2,163,436	18,762	1,048,174	21,207	1,081,995
All other	115,845	11,512,552	102,276	7,804,417	115,641	8,308,035
Billets, ingots, blooms, sheet, bar, and skelp	111,233	5,868,048	96,096	4,656,225	87,479	3,891,586
Bolts and nuts	18,907	3,823,324	17,495	2,930,966	16,962	2,819,041
Hammers and hatchets		396,925		348,867		418,534
Hoops and bands	38,244	4,401,997	34,141	2,942,593	28,695	2,079,432
Horseshoes	951	149,251	963	121,528	709	115,872
Horseshoe nails	1,113	305,553	1,025	275,986	919	257,035
Iron bars	12,662	1,075,518	5,054	514,311	4,616	424,539
Iron and steel scrap	65,980	1,035,637	97,748	1,531,361	82,573	1,377,033
Nails:						
Cut nails	2,300	202,906	2,122	195,547	1,616	148,369
Wire nails	45,981	4,103,330	21,665	1,934,081	9,838	833,732
All other, including tacks	5,346	1,436,978	4,739	1,133,523	6,699	1,370,949
Radiators and cast-iron house-heating boilers	5,963	1,090,128	3,875	782,044	3,567	716,814
Rails for railways, of steel	267,409	10,273,970	208,496	7,950,627	151,690	6,155,156
Railroad spikes	8,597	686,331	7,986	577,976	7,728	541,731
Railroad-track material, switches, frogs, fishplates, splices, bars, etc.	30,991	3,097,253	25,885	2,637,730	25,506	2,425,945
Saws		2,003,535	1,589	2,497,832	1,690	2,463,304
Sheets and plates:						
Galvanized	114,749	12,395,505	108,152	11,940,379	160,269	16,841,928
Iron	16,016	1,089,565	10,955	583,339	16,341	925,854
Shovels and spades		533,517		506,555		487,918
Steel:						
Plates, not fabricated	102,375	6,672,012	81,686	5,042,169	100,099	5,980,935
Sheets, black	139,105	13,514,749	148,742	13,302,370	95,433	8,210,841
Structural iron and steel	198,991	13,584,040	167,910	13,009,647	169,252	11,137,399
Tin and terne plates	124,499	14,791,961	160,997	19,430,327	161,385	18,586,890
Tubular products and fittings:						
Boiler tubes	16,518	2,397,182	12,363	1,732,237	13,859	1,783,751
Casings and oil-line pipes	64,118	7,041,769	87,383	8,977,576	107,416	10,105,512
Welded black pipes	76,591	7,398,704	64,964	6,411,242	68,886	6,666,565
Welded galvanized pipes	28,681	3,351,836	36,241	3,847,972	39,630	4,262,255
Malleable-iron pipe fittings	7,747	2,400,367	(1)	(1)	(1)	(1)
Malleable-iron screwed pipe fittings	(1)	(1)	11,024	2,855,563	6,728	1,432,721
Cast-iron pipe	15,308	1,538,500	(1)	(1)	(1)	(1)
Cast-iron pipe fittings	12,757	3,193,877	(1)	(1)	(1)	(1)
Cast-iron pressure-pipe fittings	(1)	(1)	13,364	2,527,809	16,483	1,720,213
Cast-iron soil pipes and fittings	(1)	(1)	7,432	597,034	8,994	747,614
Cast-iron screwed pipe fittings	(1)	(1)	7,975	1,352,592	9,886	2,824,767
Wire:						
Barbed	70,803	6,173,678	87,033	6,524,302	67,408	4,730,926
All other	103,985	14,437,465	58,479	8,277,471	54,553	7,954,472
All other tools		11,600,979		10,665,572		12,591,882

[1] Not so classified.

CHROMITE

By J. W. Furness [1]

INTRODUCTION

The total production of chromite (containing 30 per cent or more chromic oxide) in the United States from 1845 to 1925 was 577,404 long tons. Since 1921 the apparent domestic consumption of chromite has increased 82 per cent. This increase may be attributed mainly to the demand for noncorrosive steel and refractories. The development in Southern Rhodesia during the last few years has assured the world's consumers of a sufficient reserve of this useful metal for many years.

In 1925 the shipments of domestic chromite containing 45 per cent or more chromic oxide totaled 108 long tons, valued at $2,105. The total imports containing 45 per cent or more chromic oxide during 1925 were 149,739 long tons, valued at $1,207,420. The increasing dependence of the United States on foreign sources for its supply of chromite makes a summary of the world situation of particular importance at this time.

DISCOVERY AND PROPERTIES OF CHROMIUM

Of the eighty-odd elements that constitute the earth's crust more than two-thirds form only 0.5 per cent of the whole. Chromium is among these and may therefore be designated as one of the rare components of the lithosphere. It is a metal belonging to the oxygen group of the periodic system, a group that includes molybdenum, tungsten, and uranium. Chromium is not found as a native element, but generally as chromite (Cr_2O_3FeO), which is the only chromium mineral now used commercially. Chromite is blackish brown, gives a brown streak, has a submetallic luster, a hardness of 5.5, and a specific gravity of 4.32 to 4.57. Its crystal form is octahedral.

Chromium was unknown to the ancients and was first studied by L. N. Vauquelin and Marquart in 1786. In 1797 Vauquelin found that the lead in crocoite was in combination with an acid, which he determined to be an oxide of a new metal. The element so discovered was called chromium.

[1] The statistics on domestic production were prepared by H. M. Meyer, and the data on imports were compiled from records of the Bureau of Foreign and Domestic Commerce, by J. A. Dorsey, both of the Bureau of Mines.

USES

Chromite of the theoretical composition would contain 68 per cent chromium sesquioxide and 32 per cent iron protoxide, but usually in the mineral as found some of the iron has been replaced by varying percentages of magnesium and some of the chromium by aluminum and ferric iron. The usability, therefore, of chromite depends on the ratio of the iron to the chromium in the ore, and also on the ratios of the chromium to the alumina and magnesia and to the silica. If the iron content predominates, the ore may not be usable, nor can it be beneficiated by any now known process to yield a concentrate acceptable to manufacturers of ferrochrome. Occasionally chromium occurs as crocoite ($PbCrO_4$), chrome ochre (Cr_2O_3), and chromium garnet ($CaO.Cr_2O_3SiO_2$). Certain iron ores of Cuba, Celebes, the Gold Coast, and Greece contain from less than 1 per cent to 3 per cent chromium associated with a small percentage of nickel and are known as chromiferous iron ores. Chromium supplies the color in serpentine, chrome mica, and the emerald.

As the United States is the world's greatest consumer of chromium, the uses in this country will be assumed to be typical. In 1925 the domestic consumption was approximately apportioned as follows: 32 per cent for the manufacture of ferrochrome (metallurgical use), 27 per cent for chemicals, 41 per cent for refractories. An approximate distribution of the chromite used in refractories was bricks 88 per cent, cement 10 per cent, as ore 2 per cent. The increase of imports in 1925 as compared with 1924 was due in part to the increased demand for stainless steels and other steels containing a high percentage of chromium.

Metallurgical uses.—In the manufacture of chrome steels ferrochrome (an alloy of iron, carbon, and chrome) which has a chromium content of not less than 60 per cent is used. Ferrochrome is made by reducing the crude ores or concentrates in the electric furnace. As the alloy tends to take up much carbon, which is considered an undesirable element, the quality and price are in inverse proportion to the carbon content. The electric furnace is charged with chromite and anthracite coal. This charge is based upon the reaction $FeO.Cr_2O_3+4C=Fe.2Cr+4CO$. True reduction begins at 1,185° C. In practice the amount of carbon necessary greatly exceeds the theoretical requirements. To decarburize the high-carbon ferrochrome, the alloy is melted with a lime slag, chromite ore, and fluorspar.[2]

Ordinary chrome steel contains about 2 per cent chromium, and at present can be manufactured only by the use of ferrochrome, because no way is known to overcome the difficulties that add to the cost of making chrome steels direct from chromiferous iron ore. Chrome steels have many uses, including the manufacture of axles, springs, parts of gun carriages, automobiles, safe steel, tires, cutlery steel, projectiles, and armor plate. These steels possess great hardness combined with toughness; they can be bent cold, welded to iron to form either a surface or a core that is extremely difficult to attack with the finest drilling tools. Vanadium, nickel, tungsten, and man-

[2] Lyon, D. A., Keeney, R. M., and Cullen, J. F., The Electric Furnace in Metallurgical Work: Bull. 77, Bureau of Mines, 1914, pp. 131–141.

ganese, together with chromium, are alloyed with steel for use where the steel is subject to abrasive action.

Rustless steel contains 13 to 14 per cent chromium, 1 per cent nickel, and is low in carbon; it is chiefly used in the manufacture of cutlery. An alloy known as stellite (essentially cobalt, chromium, and tungsten or molybdenum) is especially suitable for high-speed tools. Nichrome, which contains 60 per cent nickel, 14 per cent chromium, and 15 per cent iron, is used as a high-temperature alloy; its chief uses are for annealing boxes and conveyer chains. Stainless steel containing 13 to 14 per cent chromium is used in the manufacture of exhaust valves, turbine blades, pump rods, rollers for bearings in electric heating stoves, and utensils.[3]

Chemical uses.—Chromite is of great importance to the chemical industries, for it is the source of the chromium used for making chromates and bichromates. Chrome pigments—yellow, green, and red—are widely used. The soluble chromates and bichromates are used as mordants in the dye industry, in the tanning of chrome leathers, and in the bleaching of fats and oils; in the ceramic industry the chromic acids and the bichromates are used to impart certain colors to pottery. The United States imports considerable quantities of these compounds each year.

As a refractory.—Chromite as a refractory has no satisfactory substitute. Its most important use is as a liner for the open-hearth furnace in the manufacture of steel. The War Industries Board assumed, from a study made by its metal section, that 2½ pounds of chromite were utilized for every ton of steel manufactured. Without chromite the production of steel would be decidedly curtailed. Chromite is used either as bricks or in irregular shapes as mined. It has a decided advantage over magnesite and silica-alumina mixtures in that it resists corrosion and will withstand rapid changes of temperature. In high-temperature metallurgy the use of chromite is imperative.

Other possible uses.—Of the future uses of chromium one of the most interesting is for coating metals.[4] In this country and abroad the electrolytic plating of various metals with chromium has been successful experimentally and is now (1926) in use on a commercial scale. The coating is hard and white, resembling platinum; it resists the action of ammonia fumes, hydrogen sulphide, and nitric acid, and is not attacked by molten zinc, tin, or brass. From the noncorrodibility of the metal in vegetable and fruit acids there is a possibility that chromium may, when produced more cheaply, supplant tin for some purposes. The research done on chromium, in high-temperature and in noncorrosive alloys, bids fair to revolutionize some of the older industrial processes and to make new ones possible.

---

[3] Chemical and Metallurgical Engineering: Vol. 22, 1919, p. 438.

[4] Engineering and Mining Journal-Press, "Plating base metals with chromium": Vol. 120, 1925, p. 624. The Metal Industry, "The corrosion resistance of chromium-plated steel." Ollard, E. A., vol. 27, 1925, pp. 235–237. The Metal Industry. "Notes on the plating of chromium on steel," Enos, Geo. M., vol. 27, 1925, pp. 261–262. The Metal Industry, "Chromium plating—a warning," vol. 27, 1925, pp. 331–332. Canadian Mining Journal, "Chromium plating of steel," vol. 45, 1924, p. 1105. The Chemical Age, "Chromium-plated steel," Feb. 6, 1926, vol. 14, p. 12. General Survey of Chromium Plating, by E. A. Ollard, A. R. C. Sc. Anodes—Theory of Working—Corrosion—For Motor Car Head Lamps—For Cutlery and Tableware—For Reflectors, Compared with Silver. Miscellaneous Domestic and Industrial Uses—For Printing Plates and Machine Parts—Chromium Plating—Castings—Cost, Compared with Nickel Plating—Conclusions. American Metal Market (Monthly review section), vol. 33, Mar. 18, 1926, pp. 9–10.

FORMATION AND OCCURRENCE OF CHROMITE

According to Vogt,[5] "All the chromite deposits yet known occur in peridotite or in the serpentine arising from the decomposition of that rock, though the discovery of new deposits in pyroxenite, or olivine-pyroxenite, so closely allied to peridotite, may be regarded as not impossible." Chromite deposits are formed by magmatic segregation. They occur as lenses or tabular masses, many of which are of such low grade or so small as to be of little or no value. Variations in the quantity of ore and the tendency to blend into the parent magma or the barren country rocks make chromite mining in most places a most uncertain undertaking. Detrital deposits, the result of the disintegration of chromite-bearing serpentines, occur in bodies of commercial size.

(For "Prices" see p. 147.)

WORLD'S PRODUCTION

Production of crude chromite, 1921–1925, by countries, in metric tons[1]

Country	1921	1922	1923	1924	1925
Australia	63	537	1,211	785	978
Canada	2,538	696	3,228		
Cuba	[2] 610		[3] 10,587	[3] 19,881	[3] 25,689
Great Britain		605	555	1,060	[4]
Greece	8,029	9,213	14,828	14,651	[4]
Guatemala	[2] 407				
India	35,320	23,143	55,113	46,192	[4]
Japan	3,368	3,757	4,526	5,362	[4]
New Caledonia [3]	29,458	19,374	23,220	23,021	34,732
Rhodesia, Southern	45,529	84,799	87,702	156,692	123,220
Rumania		30	60		[4]
Russia [5]	4,013	847	3,004	7,266	30,670
Turkey (Asia Minor)	[4]	[7] 2,540	[4]	[4]	[4]
Union of South Africa	1,078	87		4,572	11,316
United States	287	361	231	293	110
Yugoslavia	10	15	[4]	300	[4]
	130,710	146,004	204,265	280,075	[4]

[1] Compiled by L. M. Jones, of the Bureau of Mines.
[2] Imports into the United States.
[3] Production of the Caledonia mine.
[4] Data not available.
[5] Exports.
[6] Data for year ended Sept. 30.
[7] Approximate production.

The history of the mining of chromite is of interest in that several countries have held the position of being the largest producer. From 1830 to 1870 the United States, through the shipments from the State of Maryland, led the world. In 1848 chromite was discovered in the Province of Brusa, Turkey, but not until about 1860 did production there supply appreciably the world's markets. From 1870 to 1903 Turkey was the major source of the world's supply of chromite. Intensive development in New Caledonia and Southern Rhodesia enabled these countries to furnish approximately three-fourths of the total supply from 1908 to 1922; this was supplied by the two countries in approximately equal shares. In 1922 and 1924 Southern Rhodesia produced more chromite than all other countries combined. In 1918 the United States was the leading producer, shipping 82,430 long tons.[6]

[5] Vogt, J. H. L., Report of the Sixth International Geological Congress, Zurich, 1894, pp. 382–392.

[6] During the war period requirements as to grade were greatly modified. Material that would not find a market in peace was accepted as ore. The average grade of the ore produced during the war was 41 per cent Cr_2O_3, whereas 48 per cent Cr_2O_3 is the grade required in peace.

Of the countries consuming the major part of the world's production of chromite only Russia produces its needs. France and England, through their colonies, are politically independent. Germany and the United States depend almost solely on foreign sources for their requirements. New Caledonia, Rhodesia, Turkey, India, and Greece have only a negligible domestic consumption and export virtually all ores produced.

Representative analyses of chromite from various countries [1]

Country of origin	Percentage of principal constituents					
	Chromic oxide (Cr_2O_3)	Iron oxide (FeO)	Magnesium oxide (MgO)	Aluminum oxide (Al_2O_3)	Silicon dioxide (SiO_2)	Calcium oxide (CaO)
India:						
Baluchistan	54.00	13.60	16.40	11.32	1.86	1.10
Mysore	51.04	22.50	12.00	7.53	4.50	.60
Rhodesia: Selukwee	54.40	14.45	11.70	11.06	6.00	1.00
Canada	46.00	22.50	4.90	8.09	7.70	5.60
Russia	50.80	21.60	13.00	3.30	5.40	.60
Asia Minor	52.90	15.70	16.40	6.30	1.10	
Hungary	39.00	16.10	17.20	17.50	8.00	
United States: California	44.70	14.00	16.50	16.00	8.00	
Greece	41.66	14.70	16.66	18.24	2.00	5.76
New Caledonia	55.02	12.77	8.00	11.10	3.00	.50

[1] Hoar, H. M., World Trade in Chromite: Supplement to Commerce Repts., Trade Information Bull. 252, p. 9.

POLITICAL AND COMMERCIAL CONTROL

The political and commercial control of chromite now rests largely with England. Until 1911 virtually all the chromite mined in New Caledonia was shipped by French companies, but in that year a consolidation was made with the Chrome Co. (Ltd.), of London. During the same year a sales contract was made with the Rhodesian Chrome Mines (Ltd.), and thus the Chrome Co. (Ltd.) controlled the major part of the world's output. There are several small independent producers in New Caledonia; the most important of these is a company controlled by citizens of the United States. In 1914 the Chrome Co. (Ltd.) took over the largest producer in Baluchistan. The Indian production from the Mysore Province, amounting to 11,863 long tons in 1925, seems to have been independent of the control of the Chrome Co. (Ltd.). The agencies through which this ore was shipped are Japanese, British, and American.

For many years before the war the Brusa deposits of Anatolia were operated by J. W. Whittall & Co., an English firm, as lessees. During the war these deposits were operated by Krupp's agents. Since 1918 there has been no production in this area.

Chromite mining in Rhodesia has rapidly expanded since 1922. The control over chromite supplies, exercised by the Chrome Co. (Ltd.) prior to that date, has been considerably weakened, and there are now many independent shippers.

CHROMITE MINING IN THE UNITED STATES

Crude chromite mined and shipped from mines in the United States, 1921–1925, by States

State	Ore containing 45 per cent or more of chromic oxide			Ore containing 35 to 45 per cent of chromic oxide			Total value
	Mined (long tons)	Shipped (long tons)	Value	Mined (long tons)	Shipped (long tons)	Value	
1921							
California	91	68	$1,162		55	$124	$1,286
Oregon				159	159	1,614	1,614
	91	68	1,162	159	214	1,738	2,900
1922							
California	200	163	3,354				3,354
Maryland	113	113	3,302				3,302
Montana				10			
Oregon	97	79	632				632
	410	355	7,288	10			7,288
1923							
California	69	69	1,415				1,415
Maryland	90	80	1,840				1,840
Montana				22			
Oregon	78	78	564	313			564
	237	227	3,819	335			3,819
1924							
California	213	188	940				940
Montana				20			
Oregon					[1] 100	[1] 200	[1] 200
	213	188	940	20	[1] 100	[1] 200	[1] 1,140
1925							
California	83	83	1,650				1,650
Maryland	25	25	455				455
Oregon				47			
Washington	2						
	110	108	2,105	47			2,105

[1] Ore from Oregon in 1924 contained less than 35 per cent Cr_2O_3.

Chromite production through 1925 and reserve in the United States, and cost and production during the war period

[Compiled by J. W. Furness and H. M. Meyer, Bureau of Mines]

State	Total number of deposits	Production through 1925 (30 per cent or more Cr_2O_3)[1]	Reserves available (35 per cent or more Cr_2O_3)	Production in 1918[2]		Based on War Mineral Relief claims				
				Number of deposits, producers, and shippers	35 per cent or more Cr_2O_3	Number of claims filed	Production		Total investment	Number of awards made
							Total shipped	Total on hand		
		Long tons	*Long tons*		*Long tons*		*Long tons*	*Long tons*		
California	948	288,500	212,600	374	77,224	425	40,153	22,654.48	$5,079,063.70	265
Georgia	1	54	500	1	54					
Maryland	2	150,000		2	431	1	55		40,000.00	1
Montana	5	670	500,000	3	536	6	50	465	48,456.56	5
North Carolina	5	400	1,000	5	339	2	244		67,494.57	2
Oregon	104	36,500	62,000	60	14,521	112	11,057	6,040	613,156.49	64
Pennsylvania	5	100,000	[3] 5,000	1		4	136		88,879.10	2
Washington	2	200	2,500	1	134	2	70	1.50	4,371.34	1
Wyoming	1	1,080	2,500	1	625	1	1,179		79,162.93	1
Total	1,073	577,404	786,100	[4] 448	93,864	[5] 553	52,944	29,160.98	6,020,584.69	341

State	Based on War Mineral Relief claims—Continued							
	Shipped under awards	On hand under awards	Total investment under awards	Government awards	Receipts for ore shipped under awards	Amount received per ton	Cost per ton under awards	Capital invested per ton
	Long tons	*Long tons*						
California	24,642.21	14,962.75	$3,420,990.85	$817,019.20	$1,258,509.93	$46.00	$52.00	$85.00
Georgia								
Maryland	55		40,000.00	37,586.61	221.25	4.00	69.00	725.00
Montana	50	115	43,456.56	13,071.73	5,495.00	50.00	36.30	90.00
North Carolina	244		67,494.57	41,194.22	11,266.43	46.30	215.00	275.15
Oregon	10,496.13	5,180.25	534,536.41	193,583.22	293,163.95	28.00	31.00	34.00
Pennsylvania	136		37,193.03	29,371.00	5,812.60	42.80	243.00	649.50
Washington	70		4,000.00	2,738.73	3,043.07	27.00	82.00	60.00
Wyoming	1,179		79,162.93	28,346.35	36,304.71	30.00	45.50	70.00
Total	36,872.34	20,258	4,226,834.35	1,162,911.06	1,613,816.94			

[1] The total production through 1925 was compiled from Mineral Resources of the United States, State reports, personal correspondence, and war mineral relief engineers' reports.
[2] Production in 1917 was 43,725 tons of all grades.
[3] 50 per cent Cr_2O_3.
[4] Exclusive of 2 in Alaska.
[5] Exclusive of 2 from Alaska and 13 from minor producers.

SUMMARY

The shipments of chromite from domestic mines in 1914 were 591 long tons; in 1915, 3,281 tons; in 1916, 47,035 tons; in 1917, 43,725 tons; and in 1918, 82,430 tons. In 1917 the domestic mines supplied 38 per cent of the country's needs and in 1918, 45 per cent. The average value in 1917 was double the normal and in 1918 three times the average value for the 10-year period prior to the war, and the grade was 41 per cent Cr_2O_3 in comparison with 50 per cent for imported ores.

The total reserves of usable ore attributed to the United States—namely, 1,252,600 tons[7]—are found in some 2,000 deposits scattered in eight States. During the war period, 1917 to 1918, the largest single deposit was exhausted by a production of sixteen thousand and odd tons. The major part of the reserves is made up of ore containing 30 to 40 per cent Cr_2O_3. If the domestic reserves were measured by the present standards of either tenor or price, the United States would be without chromite.

As an aftermath of the 1918 production the miners of chromite were compensated in part for the losses entailed by the war production under the war mineral relief act of 1919. In 1918 there were 450 producers, as follows: California, 374; Oregon, 60; Washington, 1; Alaska, 2; Montana, 3; Wyoming, 1; Pennsylvania and Maryland, 3; North Carolina, 5; and Georgia, 1. The total number of claims filed was 568. California filed 425; Oregon, 112; Alaska, 2; Pennsylvania, 4; Maryland, 1; Montana, 6; North Carolina, 2; Washington, 2; and Wyoming, 1. All of the chief producers, with one exception, filed claims. Thirteen of the minor producers (1 to 10 ton production) are not found in the war mineral relief record. The average value for the year 1918 was $47.99. From the production in the United States since 1918 it is evident that no large bodies of chromite of commercial grade have been found in this country.

In column 3 of the preceding table, "Reserves available," the tonnages given are the now accessible ores. It is assumed that in addition to these tonnages there are some 466,500 tons of ore difficult of access which could be mined only during a period of extremely high prices. These ores are in California and Montana.

IMPORTS

Crude chromite imported into the United States, 1921–1925, in long tons

[General imports]

Country	1921	1922	1923	1924	1925	
					Quantity	Value
Africa:						
British—						
East					678	$3,930
South	23,318	41,002	52,153	21,642	18,463	127,856
Portuguese—						
East		7,100	15,591	37,152	70,718	570,945
Other		4,000		26,287	6,805	50,093
Australia		4,000				
Canada	7,554	801	3,401			
Cuba	600	1	10,420	8,145	29,830	222,398
England		1,900	[a]		[b] 20	[b] 305
Greece	8,104	8,600	10,550	13,390	12,533	129,328
Guatemala	401					
India (British)	928	12,677	29,238	7,335	8,360	96,665
Japan					300	3,021
Oceania (French)	35,108	7,500	7,410	4,392	2,032	2,879
Turkey in Asia	5,822	[c] 2,500				
Turkey in Europe	1					
	81,836	90,081	128,763	118,343	149,739	1,207,420

[a] Quantity not recorded.
[b] Recorded as United Kingdom in 1925.
[c] Recorded by Bureau of Foreign and Domestic Commerce as Greece in Asia.

[7] International Control of Minerals, Min. and Met. Soc. Am. and the Am. Inst. Min. and Met. Eng., 1925, p. 39, Table 1 shows reserves of 1,378,000 tons.

Ferrochrome or ferrochromium, chrome or chromium metal, and chromium vanadium imported for consumption in the United States, September 22, 1922, to December 31, 1925, in long tons

	Sept. 22–Dec. 31, 1922 [1]	1923	1924	1925
Ferrochrome or ferrochromium:				
Containing 3 per cent or more of carbon (chromium content)		1,116	30	69
Containing less than 3 per cent of carbon, gross weight	4	295	436	588
Chrome or chromium metal	3	13	2	3
Chromium vanadium		57		32

[1] The imports for Jan. 1–Sept. 21, 1922, were recorded as 390 long tons of chrome or chromium and ferrochrome or ferrochromium.

Chromium compounds imported for consumption in the United States, 1919–1925

Year	Chromic acid			Chromate and bichromate of potash			Chromate and bichromate of soda			Chromium chloride and sulphate		
	Pounds	Value		Pounds	Value		Pounds	Value		Pounds	Value	
		Total	Average		Total	Average		Total	Average		Total	Average
1919				15,450	$4,271	$0.28				(1)	(1)	(1)
1920	1,100	$90	$0.08	4,414	2,690	.61				(1)	(1)	(1)
1921	1,969	674	.34	73,011	6,772	.09	64,236	$5,308	$0.08	(1)	(1)	(1)
1922	4,663	1,289	.28	8,584	1,676	.20	22,731	1,540	.07	(1)	(1)	(1)
1923	4,632	2,026	.44	5,563	1,033	.19	245	73	.30	2,771	$654	$0.24
1924	32,493	2,484	.08	10,486	1,924	.18				9,095	1,340	.15
1925	5,564	2,216	.40	4,379	778	.18	221	46	.21	3,520	941	.27

[1] Not separately classified prior to new tariff. None recorded Sept. 22 to Dec. 31, 1922.

Domestic sales, imports, and supply of chromite in the United States, 1919–1925

Year	Sales from domestic mines			Imports (general)			Apparent available supply		
	Long tons	Value		Long tons	Value		Long tons	Value	
		Total	Average		Total	Average		Total	Average
1919	5,079	$129,302	$25.46	61,404	$1,381,497	$22.50	66,483	$1,510,799	$22.72
1920	2,502	44,857	17.93	150,275	1,921,824	12.79	152,777	1,966,681	12.87
1921	282	2,900	10.28	81,836	654,602	8.00	82,118	657,502	8.01
1922	355	7,288	20.53	90,081	741,186	8.23	90,436	748,474	8.28
1923	227	3,819	16.82	128,763	1,123,120	8.72	128,990	1,126,939	8.74
1924	288	1,140	3.96	118,343	1,095,603	9.26	118,631	1,096,743	9.24
1925	108	2,105	19.49	149,739	1,207,420	8.06	149,847	1,209,525	8.07

CHROMITE DEPOSITS BY STATES

ALASKA

Two localities in Alaska are known to contain deposits of chromite. In 1917 the mineral was mined on the southwest end of the Kenai Peninsula, where the ore bodies occur at tidewater and are partly submerged by high tide. The ore is low grade but is amenable to concentration. It has been estimated that the reserves will yield

32,300 tons of concentrates running 40 to 45 per cent Cr_2O_3.[8] To reach eastern markets the ore has to go by sea to Seattle and thence by rail. The cost of transportation during 1918 was $15.50 a ton.

At Red Mountain, 16 miles northeast of the deposit just described, are the only other known deposits of chromite. They are low grade, averaging 30 to 40 per cent Cr_2O_3, and have not been developed. The fact that they are 6 miles from the nearest tidewater has retarded production. The reserves are estimated to be 227,900 tons of chromite. The total number of known deposits is 49.[9]

CALIFORNIA

In the Sierra Nevada chromite deposits[10] are found in the large belts of serpentine; most of them are in the western foothills of the Sierra Nevada, in Fresno, Tuolumne, Calaveras, Eldorado, Placer, Nevada, and Butte Counties.

In the Coast Range are large intrusions of serpentine that carry irregularly distributed deposits of chromite. These areas are found in San Luis Obispo, San Benito, Santa Clara, Stanislaus, Napa, Humboldt, Shasta, Trinity, Siskiyou, and Del Norte Counties.

California has produced a total of 288,500 tons, averaging 42 per cent, and is credited with 212,600 tons of reserve.[11] Of the tonnage produced during 1918, 34,489 tons were never shipped and slightly less than this amount remains on hand. The reason this material was not shipped was due to the collapse of the chromite industry after 1918.

Alameda County.—Five deposits have been opened in Alameda County; their total production has been 3,800 tons. The ore is low grade but is amenable to concentration. About one-third of the output contains 45 per cent Cr_2O_3, the remainder less than 34 per cent. The reserves are estimated to be 3,000 tons of 40 per cent and 20,000 tons of 10 per cent ore amenable to concentration, making a possible total of 5,000 tons of 45 per cent ore.

Amador County.—Amador County contains 13 known deposits. The total production has been 1,000 tons of 35 per cent ore. The promise of future production indicated by the ore in sight is not encouraging. The reserves are small, and indications are not favorable for a tonnage in excess of that already produced—about 1,000 tons of 35 per cent ore.

Butte County.—There are 34 known deposits in Butte County. The total production has been 7,500 tons of 45 per cent ore, the larger part coming from two mines. The reserves are estimated to be 5,000 tons of 42 per cent ore.

Calaveras County.—There are 38 known deposits in Calaveras County, 15 of which have produced over 80 per cent of the total county output which is 7,000 tons. The reserves are estimated to be 3,500 tons of 40 per cent ore. On the Vogelgesang ranch, 5 miles

[8] Gill, A. C., Chromite of the Kenai Peninsula: U. S. Geol. Survey Bull. 742, 1920.
[9] See note 8.
[10] The word "deposit" as herein used refers to domestic occurrences and signifies locations from which chromite has been mined.
[11] The production of mines and prospects has been compiled from Mineral Resources, State, and the war mineral relief records.

southeast of Valley Springs, the largest lens developed was 50 feet long and 10 feet wide and averaged 41 per cent chromic oxide.

Colusa County.—There are seven known deposits in Colusa County, but the only production has been three-fourths of a ton. The reserves are negligible.

Del Norte County.—There are 25 known deposits in Del Norte County. The total production has been 12,200 tons of 42 per cent; the reserves are estimated to be 10,000 tons of 30 to 45 per cent. In addition to the reserves given a considerable tonnage of concentrating ore is known.

Eldorado County.—The chromite deposits of Eldorado County lie in two well-defined belts. The western belt extends from the Consumne River in the vicinity of Latrobe northward to Rattlesnake bridge on the north fork of the American River. The eastern belt contains the deposits in the vicinity of Garden Valley and Georgetown. The high-grade ore bodies are usually small chimneys and lenses that have been exhausted by shallow workings, seldom more than 100 feet deep. Large low-grade bodies have been encountered in mining the high-grade ore. This county has at present 86 mines and prospects. The total production has been 31,000 tons, and the reserves are estimated to be 12,600 tons containing 40 per cent Cr_2O_3. The reserves given are conservative. The future production, at a price high enough, will probably be very large.

Fresno County.—The chief deposits of Fresno County lie in a small area northeast of Fresno, known as the Watts Valley mining district, which at one time was the second largest producer of chromite in the State. Several mines have been exhausted, and since 1915 production has steadily declined. The grade of the ore is 40 to 45 per cent Cr_2O_3.

At present there are 70 known mines and prospects in the county. The total production has been 53,000 tons, and the reserves are estimated to be 10,000 tons of 38 per cent ore. As the largest deposits have been exhausted, the outlook for future mining is not bright. The reserve tonnage given is probably a maximum that could be attained only at extremely high prices.

Glenn County.—There are 12 known deposits in Glenn County, near Millsaps and Neuville. Tyson & Co. mined in this county in the early days, and up to 1893 the production was in excess of 3,000 tons. The total production through 1925 is 15,000 tons, and the reserves are estimated to be 6,000 tons of possibly available ore, average grade 40 per cent.

Humboldt County.—There are now five known deposits in Humboldt County. The total produced has been 400 tons, and the reserves are negligible. The chief deposits are in the vicinity of the Horse Mountain region; the grade of the ore is high, averaging more than 45 per cent.

Lake County.—There are 30 known deposits in Lake County. The total produced has been 1,850 tons, and the reserves are estimated to be 8,000 tons of 45 per cent. Of these reserves 6,000 tons represent concentrates from ores averaging 20 per cent Cr_2O_3.

Los Angeles County.—Two deposits are known in Los Angeles County. Little development work has been done, and no production has been made.

Mariposa County.—There are four known deposits in Mariposa County, from which 90 tons of ore have been shipped. The reserves are small and because of the size of the deposits the outlook for future production is not bright.

Mendocino County.—There are 11 known deposits in Mendocino County; they are in and about Red Mountain, Little Red Mountain, and Big Red Mountain. Little development work has been done, but prospects seem very favorable for the opening of fairly large bodies of low-grade ore. The total production has been 2,000 tons. The reserves are estimated to be 10,000 tons of 40 per cent ore. At present most of the reserves are inaccessible, being more than 30 miles from a railway.

Monterey County.—There are only two known deposits in Monterey County. Their total production has been 1,500 tons, and the reserves are estimated to be 1,000 tons of 42 per cent ore. These deposits are 37 miles from a railway, and little work has been done on them.

Napa County.—There are now 55 known deposits in Napa County. This county has been prospected rather thoroughly and stripped of its high-grade ores. Little low-grade ore has been uncovered. The total production is 6,300 tons. The reserves are estimated to be 2,000 tons of 45 per cent ore.

Nevada County.—There are now 35 known deposits in Nevada County. Most of the ore is low grade, carrying less than 35 per cent Cr_2O_3, and the material shipped has been largely concentrates. The principal deposits are near Nevada City. The total production is 7,800 tons. The reserve which consists of ores running 10 to 35 per cent Cr_2O_3 is estimated to be capable of yielding 10,000 tons of concentrates carrying 40 per cent Cr_2O_3.

Placer County.—Scattered through Placer County are a number of both high and low grade deposits. Ore containing as high as 55 per cent of chromic oxide has been shipped in quantity; 12 per cent ore has been successfully concentrated to 45 per cent. There are 63 known deposits in this county. The total production has been 9,200 tons. The reserves are estimated to be 10,000 tons of 40 per cent ore. There is a large tonnage of mill ore that may perhaps be mined in the future.

Plumas County.—There are now 18 known deposits in Plumas County; they are small and inaccessible, and the ore carries about 40 per cent Cr_2O_3. The total produced is 2,600 tons, and the reserves are estimated to be 5,000 tons of 44 per cent ore, most of which is in one property.

Sacramento County.—One property which has produced 110 tons has been opened in Sacramento County. The reserves are negligible.

San Benito County.—There are now nine known deposits in San Benito County. Some ore has been mined, but little has been shipped. The chief deposits are about 40 or more miles from a railway. The total production is 100 tons, averaging 50 per cent Cr_2O_3. The reserves are negligible.

San Luis Obispo County.—There are now 88 known deposits in San Luis Obispo County. Mining began in the early days, and up to 1896 some 30,000 tons of 50 per cent ore were produced. During

the World War the main production came from old mines which contained considerable high and low grade ore. The low-grade ore is amenable to concentration. The total production is approximately 50,000 tons and the reserves are estimated to be 20,000 tons, including both crude ore and concentrates. Were prices to go high enough, this county would probably produce a larger tonnage than the estimates of reserves indicate.

Santa Barbara County.—There are six known deposits in Santa Barbara County. The total production is 470 tons of 40 per cent ore, and the reserves are estimated to be 1,000 tons.

Santa Clara County.—There are 14 known deposits in the county. The chief mines are northeast of Northampton, where a large body of low-grade concentratable rock has been developed. The average grade of the ore is less than 10 per cent, but it has been successfully concentrated to better than 50 per cent chromic oxide. The total production has been 1,300 tons. The reserves are estimated to be 5,000 tons of 50 per cent ore.

Santa Cruz County.—One deposit is known in Santa Cruz County; it has produced 70 tons of 40 per cent ore. The reserves are thought to be small, although little or no development work has been done.

Shasta County.—There are 26 known mines and prospects in Shasta County. The chief deposits are in a serpentine belt running from Dunsmuir to Gibson. The largest single body of ore ever mined in the western part of the United States was found in this county. The property was estimated to contain 16,000 tons of ore, and less than 12,000 tons has been shipped. The mines are accessible and can probably yield a considerable tonnage when prices are high. The total production through 1925 is 19,000 tons, and the reserves are estimated to be 10,000 tons of 40 per cent ore.

Sierra County.—There are 22 known deposits in Sierra County. The grade of the ore is between 35 and 45 per cent. Inaccessibility has been one of the drawbacks. The total production is 2,500 tons. The reserves are estimated to be 3,000 tons of 35 to 45 per cent ore.

Siskiyou County.—There are 123 known deposits in the county, chiefly in the areas about Yreka, Gottville, and Hamburg. Most of the deposits contain not more than a few hundred tons, but several will probably show a considerable tonnage when thoroughly prospected. Siskiyou County contains the largest reserve of potential ore in California. The total production has been 18,000 tons, and the reserves, crude and concentrates, are estimated to be 35,000 tons of 45 per cent.

Sonoma County.—There are now 18 known mines and prospects in Sonoma County, five of which have yielded the output, 4,210 tons, attributed to the county. The reserves are estimated to be 2,500 tons of 35 to 45 per cent ore.

Stanislaus County.—There are 11 known deposits in Stanislaus County. The total production has been 5,000 tons. Two-thirds of this tonnage is represented by ore running less than 35 per cent Cr_2O_3, but large bodies of the low-grade ore are amenable to concentration. Reserves are estimated to be 5,000 tons of 40 per cent ore.

Tehama County.—There are now 22 known deposits in the county. High-grade ore is found in the northwestern part and in the southeastern part is a large tonnage of low-grade ore amenable to concen-

tration. The total production is 10,000 tons of 40 per cent ore. The reserves are estimated to be 15,000 tons of 40 per cent ore, most of which would be concentrates. The crude ore averages 15 to 30 per cent.

Trinity County.—There are 39 known deposits in the county, chiefly in the northern and the southern parts. The grade of the ore is exceptionally high, 40 to 50 per cent. Many bodies of ore have not been developed because of the difficulties of transportation. The total production has been 5,200 tons. The reserves are estimated to be 8,000 tons of 40 per cent ore.

Tulare County.—There are four known deposits in Tulare County; they are near Porterville. The total production has been 2,300 tons of 35 to 40 per cent ore. The reserves are practically negligible and are estimated to be not more than 1,000 tons of 40 per cent ore.

Tuolumne County.—There are 49 known deposits in Tuolumne County. Very little ore has been mined that would run in excess of 40 per cent. Most of the ore is low grade containing less than 35 per cent Cr_2O_3. The total production is 8,000 tons. The reserves are estimated to be 5,000 tons of 40 per cent ore, chiefly concentrates.

MONTANA

The most important deposits are in the drainage basin of Boulder Creek between Red Lodge and Livingston, where a body of altered serpentine one-half to three-fourths of a mile wide carries bands or sheets of chromite. This altered serpentine can be traced 30 miles. The largest ore body so far discovered shows bands 3 to 5 feet wide and more or less continuous for 8,000 feet. It is estimated that a possible depth of 700 feet may be attained. To a depth of 100 feet the reserves are estimated to be 200,000 tons containing less than 40 per cent chromic oxide and about 18 per cent iron oxide.[12]

There are five known deposits in the State. The reserve is estimated to be 500,000 tons of 30 to 40 per cent ore.

NORTH CAROLINA

There are five known deposits in this State. The total production has been 400 tons of 45 per cent ore. The reserves are estimated to be 1,000 tons of about the same grade.

OREGON

Chromite deposits are found in two different serpentine areas—one in southwestern Oregon, in Jackson, Josephine, Douglas, Curry, and Coos Counties, and the other in eastern Oregon in the Blue Mountains in Grant, Wheeler, Baker, and Malheur Counties. Oregon has produced 36,500 tons of ore averaging 40 per cent and is credited with 62,000 tons of reserves. Of the total there remains more than 6,000 tons of ore that were mined during the war but were not shipped because the abnormally high prices collapsed when the armistice was signed.

[12] Diller, J. S. Chromite: Mineral Resources, 1918, pt. 1, p. 672.

Baker County.—There are six known deposits in Baker County. A total of 400 tons has been produced, the grade ranging from 35 to 45 per cent. The reserves are estimated to be 1,000 tons of 35 to 45 per cent ore and are in two properties.

Coos County.—There are five known deposits in Coos County. Most of them are near Coos Bay or its tributaries and have water transportation. The total quantity produced has been 150 tons and the average grade of the ore 40 per cent. The reserves are estimated to be 12,000 tons of 45 per cent ore, found in two properties, in one of which the chromite would be mainly in concentrates obtainable from the black sands of the Coos Bay shore and the other crude ore in the Iron Mountain district.

Curry County.—There are four known desposits in Curry County. The total production has been 1,100 tons. The reserves are estimated to be 10,000 tons of 42 per cent ore, of which 8,000 tons are in one property.

Douglas County.—There are three known deposits in Douglas County. The total quantity produced, according to available data, has been 1,500 tons. Near Nickel Mountain is a large deposit of chromite containing nickel. It is rather inaccessible, as it is 19 miles from a railroad. The reserve is estimated as 3,000 tons of 45 per cent ore.

Grant County.—There are 41 known deposits in Grant County, which in 1918 produced more chromite than any other county in the United States. The potential reserves are fairly large, and the transportation facilities not too difficult. The total production has been 20,000 tons. The estimated reserves, 25,000 tons, consist chiefly of low-grade ore amenable to concentration and ore containing 45 per cent Cr_2O_3. With proper mining facilities and a sufficiently high price a large tonnage of concentrates could be produced from the large bodies of low-grade ore.

Jackson County.—There are eight known deposits in Jackson County. The total production has been 350 tons, and the reserves are estimated to be 1,000 tons of 50 per cent ore.

Josephine County.—There are 37 known deposits in Josephine County. They are in the Klamath Mountains, which contain the largest body of serpentine in the State. The total production has been 13,000 tons. The reserves are estimated to be 10,000 tons of 38 per cent ore.

Malheur and Wheeler Counties.—There are a few prospects in the two counties. No production has been made, however, and the reserves are unknown.

PENNSYLVANIA–MARYLAND

The chromite-bearing serpentines of Maryland and Pennsylvania extend from Soldiers Delight, Md., to the southwest corner of Chester County, Pa. This locality contains several mines from which upward of 250,000 tons of 48 to 63 per cent ore was shipped prior to 1882. In the Soldiers Delight district the Tyson Mining Co. started work in 1827, and until 1860 a steady production was maintained. A mile northwest of Rock Springs, Md., on the Maryland and Pennsylvania line, is a large body of chromic oxide that has been worked for

many years. Part of the deposit is disseminated ore which has never been mined to any extent. So far as known there are seven deposits in the two States, and the reserves of Pennsylvania are estimated to be 5,000 tons of 50 per cent ore.

WASHINGTON

The deposits of chromite in Washington are on Cypress Island, Skagit County, near Mount Hawkins, Kittitas County, and in Okanogan County. The total production of the State has been about 200 tons. The reserves are estimated to be 2,500 tons of concentrates running 40 per cent Cr_2O_3.

WYOMING

The known deposits of Wyoming are confined to Converse County. Only one deposit has been developed. It has made a total production of 1,080 tons of 40 per cent ore. The reserves are estimated to be 2,500 tons of 40 per cent.

FOREIGN SOURCES OF CHROMITE

At present the chromite sources of primary importance are Rhodesia, New Caledonia, Turkey, and Russia; the sources of secondary importance are India, Greece, Canada, Australia, Guatemala, Cuba, Yugoslavia, Japan, and Germany.

AUSTRALIA

Production in Australia has been negligible. New South Wales and Queensland are the only producing States; the output from 1912 to 1925 was approximately 9,500 tons of 37 to 47 per cent grade, and the total has not exceeded 70,000 tons.

The maximum quantity of ore exported in any year was 5,243 tons in 1899. The grade of the ores ranges from 33 to 64 per cent. The reserves, composed of small deposits scattered over a large area, may be estimated at 150,000 tons.

New South Wales.—Mining first began in 1882, and after rather intensive prospecting for some 10 years chromite was found in more than 60 localities. The chief ore bodies are in the New England Mountains, 200 miles north of Sidney, and in the Snowy Range, about 200 miles southwest of Sidney. In the Clarence River district of the New England Mountains some 20,000 tons have been produced.[13] One of the largest mines in the Barbara district was exhausted after a production of 3,150 tons.

The largest production from the Snowy Range has come from the Cundagai-Tamut district; the first mine opened there was the Vulcan, which produced about 3,000 tons. The Helena mine in the same district is estimated to contain some 20,000 tons, running 50 per cent Cr_2O_3.[14] In 1893 the Mount Lightning mines were opened; they have produced some 8,500 tons. The ore contains less than 45 per cent Cr_2O_3.

Queensland.—Some 3,000 tons of chromite have been produced, most of it from the Elgalla mine in the Rockhampton district.

---

[13] New South Wales, Dept. of Mines and Agriculture: Annual Report, 1891, p. 218.
[14] Mineral Industry, vol. 6, p. 150, 1897.

Tasmania.—Chromite occurs in the tin placers of Pieman River, and a large body of chromiferous hematite in Ironstone Hill, near Tamar River, is estimated to contain upward of 500,000 tons of ore running 3 per cent Cr_2O_3.

CANADA

Chromite is found in the eastern townships of the Province of Quebec, in the neighborhood of Coleraine, Thetford, and Black Lake. The chief producer is the Canada Chrome Co. The ore occurs disseminated in the serpentine and as irregular pockets, masses, and streaks. This region, only a small part of which has been developed, is thought possibly to contain one of the largest reserves of chromite in Canada. When more systematic and when intensive methods are used in the development, it may rank with the world's largest producers.[15] In western Canada a small deposit of chromite on the northern slope of Taylor Basin, in the Bridge River district, is mineralogically interesting because it contains small diamonds. At present prices the producers of chromite in Canada can not compete with producers in Rhodesia and New Caledonia.

Representative samples of the Canadian chromite average 48 to 55 per cent chromic oxide, 8 to 12 per cent alumina, 1 to 6 per cent silica, 16 to 18 per cent oxide of magnesia, 13 to 21 per cent oxide of iron, and 1 to 3 per cent lime.

The total produced through 1925 has been 170,592 metric tons. The reserves are estimated to be 1,000,000 tons of 40 per cent ore, which includes concentrates.

CUBA

One of the largest known potential reserves of chromium is found in the Mayari district, where upward of 2,000,000,000 tons of iron ore contain 1 to 3 per cent chromium and a small percentage of nickel.[16] At present, owing to a lack of metallurgical knowledge, the chromium is a waste product in the production of these ores. In Mineral Resources, 1918, pages 716 to 725, is an article by E. F. Burchard on chromite and chromiferous iron ores. The summary on page 723 is as follows:

> The reserves of marketable chromite in Cuba are estimated to range from 92,500 long tons to 170,000 long tons, nearly all of it in Oriente and Camaguey Provinces. The largest known deposits of chromite in Cuba—those of the Caledonia, Cayoguan group, and Potosi claims—are near the northeastern coast of Oriente in a region difficult of access. They may yield 72,500 to possibly 130,000 tons of ore, most of which can be brought to present commercial grade by simple concentration. At the time of the examination only one deposit was ready for production and on a small scale, but the rate of production could be greatly increased by the use of an aerial tramway. It would probably require more than a year to put the other deposits in eastern Oriente in shape for production.
>
> The next largest known group of deposits is near Camaguey. They are very easy of access but are of lower grade than those in Oriente Province. They appear to contain 20,000 to 40,000 tons of ore, most of which can be gathered by hand from the surface.

---

[15] Mining Journal (London), Jan. 16, 1915, pp. 43–44. Mineral Industry, 1914, p. 46.
[16] Spencer, A. C., "Three deposits of iron ore in Cuba": U. S. Geol. Survey Bull. 340, 1908, pp. 318–329.

Near Matanzas, Cardenas, and Holguin there are a few small deposits of ore, and since the visit of the writer other similar deposits are reported to have been discovered. The ore near Holguin is of medium grade; that near Matanzas and Cardenas is generally of lower grade. The expense of hauling the ore is reported to have been almost prohibitive during the war, and thus to have retarded production.

Records and estimates indicate that the total production of chrome ore in Cuba to the end of 1918 had been between 7,500 and 8,000 gross tons of the equivalent of 50 per cent chromic oxide.

Production, shipments, and stocks of chromite at the Caledonia mine, Oriente Province, Cuba, 1924–25, in long tons

Year	Production	Shipments	Stocks [1]
1924	19,567	9,696	15,580
1925	25,283	30,187	10,676

[1] Stocks at the end of 1923 were reported as 5,709 tons.

GREECE

The Grecian ores are rarely ever above 50 per cent Cr_2O_3. Many small deposits are found in the islands of Euboea, Skyros, and Tinos. The production is small, never having exceeded 15,000 metric tons. Near Mount Ptoon is a large deposit of chromite from which the total production through 1924 was in the neighborhood of 70,000 tons of 40 per cent ore; the reserves are estimated to be 150,000 tons of the same grade. The shipments from the chromiferous iron mines amount to 2,200,000 tons. This ore contains 3.2 per cent chromium and 41 per cent iron, the rest being alumina and silica.

Production, shipments, and stocks of chromite in Greece, 1923–24, in metric tons

Year	Production	Shipments	Stocks [1]
1923	14,828	13,350	7,312
1924	14,651	12,690	9,273

[1] Stocks at the end of 1922 were given as 5,834 tons. The stocks at the end of 1923 and 1924 have been calculated.

GUATEMALA

Late in 1917 chromite ore was shipped from the interior of Guatemala. The ore occurs in serpentine. The deposits are said to be large, but no accurate estimate of reserves is obtainable. The International Railway of Central America and an American company own the deposits, which are about 100 miles from Puerto Barrios, and because of difficult transportation can be worked only when prices are high. The ore shipped in 1918 was the highest grade entering the American market—58 per cent. It was used chiefly by the Grasselli Chemical Co.

INDIA

Chromite occurs near Salem, Madras, and Andaman, but no shipments have been made from those districts. It is also found in the

Quetta-Pishin and Zhob districts of Baluchistan, where mining first started in 1903. The ore occurs in irregular segregated masses in serpentine. The production through 1925 of the two last-named districts is reported at about 100,000 tons. The grade of the ore is very high. In the districts of Hassan and Shimoga, State of Mysore, are chromite deposits that have yielded some thousands of tons of ore. The production has not been greater because the deposits are irregular and pockety.

The total production for India has been 105,000 tons, most of it from Baluchistan. The reserves are estimated to be 800,000 tons of 50 per cent ore.[17]

NEW CALEDONIA

All of the important deposits of New Caledonia [18] are in serpentine in the southern part of the island. Mining began in 1866, and ores were exported in 1880. There are three general types of deposits—rock chrome, consisting of solid ore bodies, residual chromite, and chromite sands and gravels in stream deposits. Only the first and second types are commercially important. Some of the ore bodies are very large. One open cut produced more than 200,000 tons of chromite, averaging 55 per cent Cr_2O_3. In 1921 the island was rather carefully prospected, but no new bodies of ore were discovered.

Some of the principal mines are the Lucky Hit, Pensee, Alice Louise, and the Tiebaghi. The last of these at times has produced 5,000 tons per month of ore, averaging 55 per cent Cr_2O_3. The size of the ore bodies is indicated by the Borcingstorix mine at Unia, on the east coast, 63 miles from Noumea. This mine was opened in 1913 and was exhausted by 1919, after producing 60,000 tons of an average grade of 53 per cent. During 1921 the Société Le Nickel started the construction of a hydroelectric plant at Yate on the east coast. This plant will manufacture ferrochromium as well as ferronickel.

Large bodies of concentrating ore are undeveloped but in time will be mined. The total production through 1925 has been 885,000 tons. The reserves, not considering the alluvial chromite or the concentratable rock, are estimated to be more than 1,500,000 tons of 50 per cent ore.

RHODESIA

The mines in Rhodesia are probably the most extensive and important now known. In 1911 the Chrome Co. (Ltd.), of London, was formed, which through an agreement with the owners of deposits in Rhodesia was able to dominate the world's market.

The chief mines are in the Selukwe district; they have been described by Zealley.[19] The most striking feature is that the most important deposits are in talc schists, and in carbonate and talc-car-

[17] Mysore Report, Chief Inspector of Mines, 1906 and 1907, p. 36: India Geological Survey Records, Part II, 1916, p. 148. India Geological Survey Records, Part II, 1917, p. 38.

[18] Compton, Geo., "New Caledonia and the Isle of Pines": Min. Jour., London, vol. 49, 1917, p. 714. "Chromite industry of New Caledonia": Min. Jour., London, vol. 134, 1921, p. 714. "Mineral industry in Caledonia": Min. Jour., London, vol. 141, 1923 p. 446.

[19] Zealley, A. E. V., "Geology of chrome deposits of Selukwe, Rhodesia": Trans. and Proc. Geol. Soc. South Africa, 1914, vol. 17, pp. 60–74.

bonate schists, chlorite schist, serpentine, and silicified serpentine. Usually the chromite bodies are near the margin of the talc-schist areas, but occasionally they pass into the adjacent formation.

More than 130 lenses of chromite have been mapped, by far the largest proportion ranging from 150 to 400 feet long. In the Chrome (Ltd.) mine 8 or 10 large bodies are being quarried which had yielded up to 1922 over 450,000 tons. Because of the size and the nature of the deposit most of the ore can be shipped without concentration, but there is much low-grade ore that can be concentrated.

Chromite deposits occur also in the Lomagundi, Victoria, and Makwiro districts.[20] The grade of the ore will average 45 per cent.

To the end of 1925, Rhodesia has produced 750,000 tons. The reserves are estimated to be 2,000,000 tons of 50 per cent ore, in addition to a very large amount of concentrating ore.

RUSSIA

The only chromite mines in Russia are those in the serpentine areas of the Ural Mountains. Prior to the World War the yearly output was in excess of 30,000 tons of 50 per cent ore. The production of 1920, 1921, 1922, and 1923 averaged about 2,700 tons per year.

Production and shipments of chromite in Russia, 1924–25, in metric tons

[For the operating year, Oct. 1 to Sept. 30]

Year	Production	Shipments
1924	7,266	7,040
1925	30,670	12,600

SOUTH AFRICA

Natal.—Chromite mining has not been attempted in Natal, because the known deposits average only 20 to 30 per cent Cr_2O_3, but there are bodies that will probably warrant mining some day.

Transvaal.—West of Pretoria is a body of chromite that does not average more than 35 per cent of Cr_2O_3. It carries traces of gold and platinum and is difficult to concentrate. In the Lydenburg district are fairly large deposits of chromite associated with altered serpentine. Large deposits have been discovered in central and western Transvaal, but their tenor does not exceed 38 per cent of Cr_2O_3, and little mining has been done. The deposits unquestionably will be of considerable importance in the future.

WEST AFRICA

Togoland.—There is a small deposit of chromite in Togoland, and the existence of larger deposits there is regarded as highly possible.

TURKEY

The chief deposits of Asia Minor are in the Province of Brusa. Although they were discovered in 1848, their production did not

[20] Rumbold, W. G., Chromium Ore: Imperial Institute Monograph, 1921, p. 21.

supply an appreciable part of the world's demand until about 1860. Up to 1903 Turkey supplied half of the world's production, but the discovery of the New Caledonian deposits cut down the output. For some years before the war the production amounted to 10,000 to 15,000 tons per annum, although the capacity was 200,000 tons per annum. The Daghargi or Alabarda mines, some 40 kilometers south of Brusa, are estimated to contain upward of 10,000,000 tons of high-grade ore. To the end of 1925 the total production from Asia Minor is estimated as 350,000 tons. The total reserves of Turkey are estimated to be 15,000,000 tons of 50 per cent ore.

PRICES

The price at which chromite was produced before the World War was relatively constant. During 1916, 1917, and 1918 the price fluctuated materially. In the spring of 1918 the price reached a peak of $47.99 per long ton for 50 per cent tenor, in comparison with prices from 1909 to 1914, inclusive, ranging from $11 to $14.75. The effect that the rise or fall of the price of chromite has on the price of steel is only fractional. On the other hand, in the chemical and refractory uses, where chromite is the major part of the material used, a higher price for chromite correspondingly increases the price of the finished product. The New York prices of chromite, on the basis of 50 per cent Cr_2O_3, from 1912 to 1925, inclusive, were as follows according to the Engineering and Mining Journal:

Quoted prices per long ton of chromite at New York, 1912–1925

1912	$13.70	1919	$17.25
1913	11.19	1920	17.93
1914	14.75	1921	10.28
1915	11.20	1922	22.53
1916	15.44	1923	19.00
1917	24.00	1924	21.35
1918	44.99	1925	21.92

LEAD AND ZINC PIGMENTS AND SALTS

By J. A. Stader and A. Stoll [1]

GENERAL CONDITIONS

Lead and zinc pigments and salts are made both by smelting and by chemical processes. Basic lead sulphate, or sublimed lead, and the various lead oxides are lead pigments produced by sublimation in oxidizing furnaces; basic carbonate white lead and the lead salts are made by chemical processes. Basic lead sulphate, or sublimed lead, is made directly from ore, but the lead oxides as well as white lead and lead salts are made from pig lead.

Zinc oxide and leaded zinc oxide are made by the American process directly from ore by sublimation in an oxidizing furnace, but some zinc oxide is made in this country by the French process, in which metallic zinc is sublimated in an oxidizing furnace. Lithopone and zinc salts are made by chemical processes, the zinc base being derived from zinc ore, metallic zinc, galvanizers' ashes, or scrap zinc. Lithopone is made by mixing equivalent portions of solutions of zinc sulphate and barium sulphide, which brings about a mutual precipitation of zinc sulphide and barium sulphate either in chemical combination or as a very intimate mixture.

The steady activity of the lead and zinc pigments industries in 1925 was evidenced by the large aggregate of sales reported by domestic producers. All lead pigments sold at a higher average price per ton than in 1924, but the average selling price of two zinc pigments, lead-free zinc oxide and lithopone, declined $8 and $10 per ton, respectively. Much larger sales in 1925 made the total value of these two pigments over $4,000,000 more than in 1924.

A study of the following tables shows a 13 per cent increase in the sales of red lead in 1925, as compared with 1924, and a 16 per cent increase in sales of litharge. This increase seems to be due to the continued growth of the manufacture of storage batteries, which consumes a large part of these lead oxides. On the other hand, the combined sales of the lead pigments (white lead and basic lead sulphate or sublimed lead) which are used more especially in the manufacture of paint declined 11 per cent. This decline is more than offset by gains in the output of the zinc oxides and lithopone, sales of which increased 16 per cent and 32 per cent, respectively, in 1925.

PRODUCTION

In this chapter the pigments and salts sold are taken to represent the production, no account being taken of the stocks on hand at the beginning and end of the year. The amounts used by producers at their own plants are included under sales.

[1] Figures on imports and exports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

Lead pigments sold by domestic manufacturers in the United States, 1916–1925, in short tons

Year	White lead		Basic lead sulphate or sublimed lead		Red lead	Orange mineral	Litharge
	Dry	In oil	White	Blue			
1916	32,938	96,041	10,977	1,287	[1] 23,035	(1)	37,739
1917	27,869	87,331	8,231	1,369	[1] 25,478	(1)	44,102
1918	20,089	82,799	7,403	1,343	[1] 30,069	(1)	48,874
1919	30,085	109,005	9,068	1,350	[1] 32,362	(1)	46,739
1920	33,678	112,017	12,412	928	[1] 34,431	(1)	62,329
1921	26,738	143,545	11,568	463	21,805	381	41,909
1922	41,598	153,393	13,765	972	30,509	370	58,261
1923	37,786	125,087	11,949	800	38,037	646	75,107
1924	42,622	144,872	14,572	1,088	36,813	331	74,724
1925	43,426	120,479	14,996	1,090	41,669	840	86,546

[1] Figures for red lead include orange mineral prior to 1921.

Lead pigments and salts sold by domestic manufacturers in the United States, 1924–25

	1924			1925		
	Short tons	Value (at plant, exclusive of container)		Short tons	Value (at plant, exclusive of container)	
		Total	Average		Total	Average
Basic lead sulphate or sublimed lead:						
White	14,572	$2,391,038	$164	14,996	$2,692,069	$180
Blue	1,088	178,899	164	1,090	210,933	194
Red lead	36,813	7,707,264	209	41,669	9,445,527	227
Orange mineral	331	89,825	271	840	237,408	283
Litharge	74,724	14,597,434	195	86,546	18,587,399	215
White lead:						
Dry	42,622	7,900,519	185	43,426	8,622,977	199
In oil	144,872	35,003,984	242	120,479	31,352,776	260
Lead acetate	(1)	(1)	(1)	(1)	(1)	(1)
Lead arsenate	(1)	(1)	(1)	(1)	(1)	(1)

[1] Statistics for lead arsenate and lead acetate collected biennially by the Bureau of the Census for odd years. Figures for 1925 are not yet available.

Zinc pigments and salts sold by domestic manufacturers in the United States, 1916–1925, in short tons

Year	Zinc oxide	Leaded zinc oxide	Lithopone	Zinc chloride (50° Baumé)	Zinc sulphate
1916	100,339	23,003	51,291	(1)	(1)
1917	107,586	23,450	63,713	(1)	(1)
1918	100,286	26,714	62,403	(1)	(1)
1919	117,639	27,591	78,365	[2] 59,228	[2] 2,763
1920	99,444	30,460	89,373	[2] 68,945	[2] 3,072
1921	74,329	16,103	55,016	59,457	3,295
1922	128,465	19,613	83,360	41,627	5,078
1923	126,987	23,504	98,199	42,431	5,375
1924	131,470	26,729	109,469	51,054	4,674
1925	151,354	31,750	145,019	45,619	5,332

[1] No canvass.

[2] Figures cover production, not sales.

Zinc pigments and salts sold by domestic manufacturers in the United States, 1924–25

	1924			1925		
	Short tons	Value (at plant, exclusive of container)		Short tons	Value (at plant, exclusive of container)	
		Total	Average		Total	Average
Zinc oxide [1]	131,470	$19,784,257	$150	151,354	$21,441,347	$142
Leaded zinc oxide [1]	26,729	3,356,965	126	31,750	3,966,282	125
Lithopone	109,469	12,531,397	114	145,019	15,186,147	105
Zinc chloride, 50° Baumé	51,054	2,051,782	40	45,619	2,003,828	44
Zinc sulphate	4,674	228,709	49	5,332	269,763	51

[1] Zinc oxide containing 5 per cent or more of lead is classed as leaded zinc oxide.

SOURCE

Metal content of lead and zinc pigments and salts produced by domestic manufacturers, 1924–25, by sources, in short tons

Source	1924				1925			
	Lead		Zinc		Lead		Zinc	
	Pigments [1]	Salts [2]	Pigments	Salts	Pigments [1]	Salts [2]	Pigments	Salts
Domestic ore	15,338	(2)	108,002	1,075	17,547	(2)	110,554	673
Foreign ore	545	(2)	280			(2)		
Metal	250,930	(2)	33,096	450	256,064	(2)	33,581	453
Secondary material [3]		(2)	9,021	10,225		(2)	11,714	10,928
	266,813	(2)	150,399	11,750	273,611	(2)	155,849	12,054

[1] Includes also lead recovered in zinc oxide and leaded zinc oxide.
[2] The source of the lead contained in lead salts is unknown to the authors, as statistics of production are collected biennially by the Bureau of the Census and for odd years only.
[3] Zinc ashes, skimmings, drosses, and old metal.

The foregoing table gives amount of lead and zinc contained in pigments and salts manufactured in 1925. It shows that 94 per cent of the lead content of these pigments was from pig lead and the remainder from domestic ore, and that 71 per cent of the zinc content of the pigments was derived from domestic ore, 22 per cent from slab zinc used in the manufacture of French process zinc oxide, and the remainder from secondary materials. More than 90 per cent of the zinc content of the zinc salts made came from secondary sources.

A canvass of the kinds of zincky material used in the manufacture of lithopone in 1925 shows that 65 per cent was from zinc ore and retort residues and the remainder from secondary sources, zinc ashes and skimmings. A similar canvass of the zinc oxide plants shows that 73 per cent of the oxide was from zinc ore, 25 per cent from slab zinc, and 2 per cent from secondary materials.

IMPORTS AND EXPORTS

The imports and exports of lead and zinc pigments in 1925 showed no striking changes from figures for recent years except that exports of zinc oxide were nearly three times those of 1924 and larger than in any year since 1920. The bulk of the shipments went to the United Kingdom and to Canada.

Basic carbonate white lead, red lead, litharge, and orange mineral imported for consumption in the United States, 1916–1925

Year	Basic carbonate white lead		Red lead		Litharge		Orange mineral	
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
1916	88,617	$8,050	20,467	$5,302	1,320	$150	70,934	$8,281
1917	20,238	1,965	50	13			33,294	4,892
1918	508	202	5	1	100	12		
1919	21,213	2,490	7,199	1,136			39,781	5,082
1920	159,977	19,449	23,076	1,789	21,002	2,647	52,094	5,352
1921	124,176	12,598	12,236	689	100	7	77,937	7,830
1922	222,465	21,335	1,405	94	1,770	162	111,419	9,729
1923	336,892	31,386	3,600	220	22,525	1,314	116,293	9,031
1924	141,156	13,478	1,874	155	1,838	193	99,341	8,047
1925	213,028	21,535	3,452	268	2,417	330	58,522	6,278

Zinc oxide, lithopone, zinc sulphide (white), zinc chloride, and zinc sulphate imported for consumption in the United States, 1916–1925

Year	Zinc oxide				Lithopone	
	Dry		In oil		Short tons	Value
	Short tons	Value	Short tons	Value		
1916	447	$181,319	18	$4,076	2,341	$405,730
1917	119	52,649	5	876	224	29,199
1918	162	62,703	4	1,043		
1919	105	44,338	3	1,351	739	122,708
1920	1,431	289,890	14	3,596	1,714	263,240
1921	1,286	145,071	57	17,549	5,247	432,019
1922	2,712	361,599	42	8,595	10,263	885,671
1923	1,036	169,415	89	21,934	10,440	776,383
1924	1,703	229,629	110	25,874	6,830	543,025
1925	1,274	205,582	132	31,187	6,330	478,395

Year	Zinc sulphide [1]		Zinc chloride		Zinc sulphate	
	Pounds [1]	Value	Short tons	Value	Short tons	Value
1916	63,419	$8,862	2	$453	(2)	$22
1917	9,990	6,519	2	403	(2)	57
1918	2,670	993	98	15,177		
1919	10,035	4,413	1	192	(2)	152
1920	45,482	15,027	565	76,495	50	3,038
1921	93,537	8,330	2,199	213,995	17	820
1922	27,159	8,453	1,374	87,509	17	1,064
1923	11,844	5,403	551	44,164	20	3,466
1924	9,678	5,727	319	28,911	13	1,265
1925	14,604	5,589	469	50,712	17	1,368

[1] Zinc sulphide is stated in pounds rather than tons because of its high value and smaller quantities.
[2] Less than 1 ton.

White lead and red lead exported from the United States, 1916–1925

Year	White lead [1]		Red lead [2]	
	Short tons	Value	Short tons	Value
1916	13,718	$2,137,072	([3])	([3])
1917	9,869	2,089,659	[3] 1,086	$267,238
1918	7,794	1,756,739	2,870	662,584
1919	14,017	3,037,292	3,114	735,177
1920	14,901	3,195,101	1,532	365,575
1921	5,161	993,130	548	115,500
1922	4,598	710,765	1,683	294,133
1923	[1] 5,172	836,261	[3] 1,840	372,828
1924	[1] 5,055	853,444	[2] 940	210,598
1925	[1] 6,832	1,293,168	802	183,591

[1] Exports of white lead and basic lead sulphate or sublimed lead not classified separately after 1922; the figures for 1923–1925 may include an unknown quantity of basic lead sulphate or sublimed lead.
[2] Exports of red lead and litharge not classified separately for 1923–24; the figures for those years may include an unknown quantity of litharge. Figures for other years are for red lead only.
[3] Not classified separately prior to July 1, 1917.

White lead [1] exported from the United States, 1924–25, by destinations

[Figures in parentheses not duplicated in totals]

Destination	1924		1925	
	Short tons	Value	Short tons	Value
Africa	([2])	$158	([2])	$103
Asia	185	42,954	245	56,939
Philippine Islands	(179)	(41,536)	(225)	(52,266)
Australia and Oceania	10	2,553	10	2,832
Australia	(5)	(1,196)	(4)	(947)
New Zealand			(1)	(405)
Canada	176	30,576	99	18,595
Cuba	69	15,226	80	17,746
Europe	2,912	450,820	4,772	835,060
Belgium	(847)	(123,558)	(113)	(19,096)
Netherlands	(437)	(65,987)	(484)	(82,103)
United Kingdom	(1,614)	(258,720)	(4,174)	(733,794)
Mexico	96	23,928	128	33,331
Panama	58	12,838	353	84,380
South America	1,443	249,786	1,035	217,241
Brazil	(2)	(589)	(1)	(341)
Colombia	(9)	(2,268)	(23)	(5,276)
Uruguay	(98)	(15,915)	(55)	(10,337)
Venezuela	(9)	(2,078)	(13)	(3,562)
Other countries	106	24,605	110	26,941
	5,055	853,444	6,832	1,293,168

[1] White lead and basic lead sulphate or sublimed lead not classified separately after 1922; the figures may include an unknown quantity of basic lead sulphate or sublimed lead.
[2] Less than 1 ton.

Zinc oxide and lithopone exported from the United States, 1916–1925

Year	Zinc oxide		Lithopone	
	Short tons	Value	Short tons	Value
1916	13,942	$2,394,709	([1])	([1])
1917	15,446	3,148,898	([1])	([1])
1918	12,421	2,779,507	([1])	([1])
1919	14,703	3,059,276	([1])	([1])
1920	11,164	2,151,544	([1])	([1])
1921	2,511	426,253	([1])	([1])
1922	3,977	593,128	1,616	$169,982
1923	5,024	743,577	1,485	176,624
1924	3,927	605,630	923	104,783
1925	10,855	1,503,561	1,287	132,771

[1] Not classified separately prior to 1922.

Zinc oxide exported from the United States, 1924–25, by destinations

[Figures in parentheses not duplicated in totals]

Destination	1924		1925	
	Short tons	Value	Short tons	Value
Asia	123	$19,660	149	$30,942
Philippine Islands	(64)	(9,474)	(86)	(13,436)
Australia and Oceania	8	2,160	31	6,628
Canada	2,562	374,917	4,320	630,149
Cuba	28	6,466	36	7,978
Europe	794	114,591	5,889	743,090
France	(23)	(3,130)	(92)	(12,655)
Italy	(11)	(2,400)	(160)	(20,736)
United Kingdom	(694)	(98,483)	(4,872)	(615,371)
Mexico	98	19,784	59	13,127
Panama	52	11,912	136	31,156
South America	191	40,183	197	31,592
Brazil	(38)	(7,460)	(11)	(2,007)
Other countries	71	15,957	38	8,899
	3,927	605,630	10,855	1,503,561

PRICES AND VALUE

The total value and the average price per ton received from sales of lead and zinc pigments and salts in 1925 are given on preceding pages of this chapter.

Market quotations on these products are printed weekly in the Oil, Paint and Drug Reporter. The range is as follows:

Range of quotations on lead pigments and zinc pigments and salts at New York, 1923–1925, in cents a pound

Product	1923	1924	1925
Basic lead sulphate, or sublimed lead	8¼- 9¼	8¾-10½	9½-11½
White lead, or basic lead carbonate	8¼- 9¾	8¾-10½	10¼-12
Litharge	9. 9-10. 9	10. 4-12¼	11¼-13¼
Red lead	10. 4-11. 4	10. 9-12¾	11½-13¾
Orange mineral	13. 4-15. 5	13. 9-15¾	13½-16¾
Zinc oxide	8 - 9	8⅜	7¾- 8⅜
Lithopone	6¼- 7½	6⅝- 7⅝	6⅛- 6⅝
Zinc chloride	2⅞- 4	2½- 3¼	2½- 4¼
Zinc sulphate	2½- 4	3 - 3¾	3½- 4

The above quotations represent the following grades and forms:

Basic lead sulphate (white), or sublimed lead, "in casks."
White lead, basic lead carbonate, "American, dry, in casks."
Litharge, "commercial, powdered, in casks."
Red lead, "dry, in casks."
Orange mineral, "American, in casks."
Zinc oxide, "commercially lead-free, in barrels, l. c. l."
Lithopone, "in barrels, l. c. l."
Zinc chloride, "solution, works, drums."
Zinc sulphate, "industrial, in barrels."

Quotations on lead pigments were higher in 1925 than in 1923 or 1924; those on zinc pigments were slightly lower. Prices quoted on both lead and zinc pigments were higher at the beginning of 1925 than at its close; but prices for zinc chloride were strongest at the end of the year, and prices on zinc sulphate changed very little during the year.

PRODUCERS AND PLANTS

The following companies reported sales of lead and zinc pigments and zinc salts of their own production in 1925:

White lead:	
Anaconda Lead Products Co. (electrolytic process)	East Chicago, Ind.
Carter White Lead Co	West Pullman, Chicago, Ill.
E. I. du Pont de Nemours & Co	Philadelphia, Pa.
Eagle-Picher Lead Co	East St. Louis, Ill.
Do	Cincinnati, Ohio.
Euston Lead Co	Scranton, Pa.
W. P. Fuller & Co	South San Francisco, Calif.
John T. Lewis & Bros. Co	Philadelphia, Pa.
Matheson Lead Co	Long Island City, N. Y.
National Lead Co. of California	Melrose, Calif.
National Lead Co	Chicago, Ill.
Do	St. Louis, Mo.
Do	Brooklyn, N. Y.
Do	Port Richmond, N. Y.
Do	Cincinnati, Ohio.
National Lead & Oil Co. of Pennsylvania	New Kensington, Pa.
Sherwin-Williams Co	Chicago, Ill.
United Lead Co	Perth Amboy, N. J.
Wetherill & Bro	Philadelphia, Pa.
Basic lead sulphate, or sublimed lead:	
Eagle-Picher Lead Co	Joplin, Mo.
St. Louis Smelting & Refining Works of National Lead Co	Collinsville, Ill.
Red lead, orange mineral, and litharge:	
Eagle-Picher Lead Co	East St. Louis, Ill.
Do	Joplin, Mo.
Do	Newark, N. J.
Do	Cincinnati, Ohio.
Evans Lead Co	Charleston, W. Va.
Franklin Lead Oxide Co	Franklin, Pa.
W. P. Fuller & Co	South San Francisco, Calif.
Harshaw, Fuller & Goodwin Co	Cleveland, Ohio.
John T. Lewis & Bros. Co	Philadelphia, Pa.
Matheson Lead Co	Long Island City, N. Y.
Metals Refining Co	Hammond, Ind.
National Lead Co. of California	Melrose, Calif.
National Lead Co	Chicago, Ill.
Do	St. Louis, Mo.
Do	Brooklyn, N. Y.
National Lead & Oil Co. of Pennsylvania	New Kensington, Pa.
Pennsylvania Smelting Co	Carnegie, Pa.
Sherwin-Williams Co	Chicago, Ill.
Wetherill & Bro	Philadelphia, Pa.
Zinc oxide and leaded zinc oxide:	
American Zinc Co. of Illinois	Hillsboro, Ill.
American Zinc Oxide Co	Columbus, Ohio.
Eagle-Picher Lead Co	Hillsboro, Ill.
Empire Zinc Co	Canon City, Colo.
Grasselli Chemical Co	Grasselli, Ind.
International Lead Refining Co. (French process)	East Chicago, Ind.
Do. (French process)	Akron, Ohio.
Mineral Point Zinc Co	Mineral Point, Wis.
New Jersey Zinc Co. (of Pennsylvania)	Palmerton, Pa.
Do. (French process)	Freemansburg, Pa.
Ozark Smelting & Mining Co	Coffeyville, Kans.
River Smelting & Refining Co	Florence, Colo.
U. S. Zinc Co	Pueblo, Colo.
Western Zinc Oxide Co	Leadville, Colo.
York Metals & Alloys Co	York, Pa.

Lithopone:	
Chemical & Pigments Co. (Inc.)	St. Helena, Md.
E. I. du Pont de Nemours & Co	Newark, N. J.
Do	Philadelphia, Pa.
Eagle-Picher Lead Co	Argo, Ill.
Grasselli Chemical Co	Grasselli, N. J.
Krebs Pigment & Chemical Co	Newport, Del.
Mineral Point Zinc Co	Depue, Ill.
New Jersey Zinc Co. (of Pennsylvania)	Palmerton, Pa.
St. Louis Lithopone Co	Collinsville, Ill.
Sherwin-Williams Co	Chicago, Ill.
United Color & Pigment Co	Newark, N. J.
Zinc salts:	
American Zinc & Chemical Co	Langeloth, Pa.
Arkansas Preservative Co	North Little Rock, Ark.
Charles Cooper & Co	Newark, N. J.
General Chemical Co	Chicago, Ill.
Grasselli Chemical Co	Grasselli, Ind.
Do	Grasselli, N. J.
Do	Cleveland, Ohio.
Do	Weirton, W. Va.
Great Western Electro-Chemical Co	Pittsburg, Calif.
Charles Lennig & Co. (Inc.)	Philadelphia, Pa.
Merrimac Chemical Co	Everett, Mass.
Monsanto Chemical Works	East St. Louis, Ill.
New Jersey Zinc Co. (of Pennsylvania)	Palmerton, Pa.

Recent changes in the operation of plants are as follows: The California Zinc Pigments Co. is building a plant at Anaheim, Calif., for the manufacture of zinc oxide; zinc concentrates will furnish the zincky material and the silver-lead residue will be shipped to the Selby smelter. The operation of the lithopone plant at Argo, Ill., formerly in the name of the Midland Chemical Co., was taken over by the Eagle-Picher Lead Co., October 1, 1925. The St. Louis Lithopone Co. reported the installation of enough equipment to increase the capacity of its lithopone plant at Collinsville, Ill., to 12,000 tons a year. The zinc chloride plant at Weirton, W. Va., formerly operated by the By-Products Steel Corporation, was sold to the Grasselli Chemical Co. and operated by them in 1925.

MANGANESE AND MANGANIFEROUS ORES

By J. W. Furness[1]

INTRODUCTION

In 1925 the domestic shipments of manganese ore containing 35 per cent and more of metallic manganese were 98,324 gross tons, valued at $1,857,769, an increase in tonnage of 74 per cent over 1924, when the output was 56,515 tons, valued at $1,307,477. The difference in average value for the two years is due to the fact that the ratio of the production of chemical ore to that of metallurgical ore decreased, but the quantity of chemical ore produced was nearly the same. The outstanding feature of 1925 was the production in the Butte (Mont.) district of 47,507 tons of rhodochrosite. Most of this ore contained 38 per cent Mn, 2.54 per cent FeO, and 6.11 per cent SiO_2 and was utilized in the manufacture of ferromanganese.

The imports of ore are estimated by the Bureau of Mines as 615,000 gross tons, compared with 505,000 tons in 1924. The gross weight of imports of ferromanganese in 1925 is estimated as 78,713 tons, compared with 56,588 tons in 1924. The imports of spiegeleisen in 1925 were 1,090 tons, compared with 7,433 tons in 1924. The increase in the imports of manganese ore during 1925 was in large part consequent to the increase in the production of steel.

Among the many industries expanded by the World War the production of manganese ore in the United States stands almost in a class by itself. Before the war the mines in this country supplied only a small fraction of our needs, but during 1918 they furnished 35 per cent of our total consumption. In order to utilize this output, requirements as to grade that were in vogue in pre-war days were greatly modified. In addition, more than a million tons of high-grade ore were imported during the war period to supplement our needs and to render the domestic ores usable (by mixture with them) without altering the standard grades of our steel. The production during 1917 and 1918 (war period) was 435,220 tons. One might infer that the domestic resources could be rapidly expanded without any material dislocation of peace-time procedure, but such expansion was not possible and only at an extreme monetary sacrifice was the war-time production made. In order to emphasize and explain this point, a summary of the manganese industry since 1918 is presented.

[1] The statistics in this report were prepared (unless otherwise stated) by H. M. Meyer, and the data on imports and exports were compiled from records of the Bureau of Foreign and Domestic Commerce by J. A. Dorsey, both of the Bureau of Mines.

MANGANESE AND MANGANIFEROUS ORES

CLASSIFICATION OF MANGANESE ORE

Of all the manganese minerals only the oxides and the carbonates have a merchantable value, although certain silicates of minor importance may be used in the manufacture of silicon-manganese and silicon-spiegel. In Mineral Resources for 1917, part 1, page 668, a new method of classifying manganese ore, based upon the requirements in vogue during the war, was adopted. The suggestion then made—that the steel industry might be satisfied and would continue the use of the grades of alloys adopted during this period—has not materialized. The trade has reverted to the old grades that were acceptable before 1917. Heretofore, in reporting the value per annum of domestic manganese ores the quantities of metallurgical ore and of chemical ore have been merged, making it extremely difficult to obtain the gross value per annum of either of the two classes. In this chapter metallurgical and chemical ores are reported separately. For comparison, however, the statistical classification laid down in Mineral Resources for 1917, already cited, will be continued.

GENERAL STATEMENT

Manganese is one of the commonest of minerals and is widely disseminated. Deposits are found in many places throughout the world, but in only a few areas are they large enough and of high enough grade to be amenable to our present needs. Of the countries producing the largest tonnage of steel, Russia alone contains manganese deposits that can more than meet its requirements. Before the war Russia, India, and Brazil produced 95 per cent of the world's requirements. In 1914 the Geological Survey of the Gold Coast, West Africa, discovered what are now known as the Dagwin deposits. Since 1922, the world's requirements have been met by the production of the countries mentioned and that of the Gold Coast. Germany and the United States depend upon foreign sources for their needs of this mineral more than any of the countries that produce steel. The war activity in domestic manganese production quickly subsided, and the United States again relies largely on foreign sources for its supply.

Requirements in the United States, however, have not been changed materially since 1918. Ninety-two per cent of all ores utilized find their way into the manufacture of steel and are used in the form of the alloys ferromanganese and spiegeleisen or as crude ores in the manufacture of low-grade manganese pig. The remaining 8 per cent is classed as "chemical ores," and of this by far the larger part is utilized in the manufacture of dry cells. With the increased demand from the radio business, this industry now consumes more than 40,000 tons of high-grade dioxide ore. The remaining smaller part is utilized in the manufacture of glass, brick, etc.

Ores for metallurgical use.—The standard requirements for metallurgical purposes are that the ore shall contain not less than 46 per cent of manganese nor more than 6 per cent of iron, 8 per cent of silicon, 0.15 per cent of phosphorus, and 0.5 per cent of sulphur.

Ores of the character outlined are known as manganese ores, a term applicable to those ores from which ferromanganese can be manufactured. With the exception of the oxides, the only other mineral that

can now be used for this purpose is rhodochrosite ($MnCO_3$).[2] Marketable ores of this mineral contain 37 per cent of manganese, less than 1 per cent of iron, and less than 10 per cent of silicon.

As manganese is added to steel as an alloy and a part of it constitutes the final product, any impurities in the crude ore are to a degree found in the resultant steel. It therefore follows that the usability of an ore depends upon its purity. For certain grades of steel a high-grade alloy is absolutely essential. To be suitable for the manufacture of ferromanganese an ore should not contain more than 6 per cent of iron, a necessary requirement, as the accepted standard grade of alloy must contain 78 per cent and more of manganese. As virtually all of the iron contained in the ore goes into the alloy, one can readily see that in making 80 per cent ferro the ratio of iron to manganese becomes an important consideration. The accepted analysis of standard ferro is manganese, 78 to 82 per cent; iron, 8 to 15 per cent; silicon, 0.5 to 1 per cent; carbon, 5 to 7 per cent; phosphorus, 0.1 to 0.3 per cent; and sulphur, under 0.03 per cent. Standard spiegeleisen, the low-grade alloy of manganese, iron, and carbon, has a manganese content of 18 to 22 per cent, iron 70 to 80 per cent, silicon 1 per cent, carbon 5 to 6 per cent, phosphorus 0.15 per cent, and sulphur under 0.05 per cent. As virtually all of the phosphorus contained in the crude ore finds its way into the resultant steel, only ore comparatively free of phosphorus can be used. This requirement eliminates the use of the major reserves of the ore found in the United States unless the specifications are modified. Ores high in sulphur are not usable, but fortunately such ores are not common.

Two alloys of manganese of lesser importance are used. Silicon-manganese contains manganese, 55 to 70 per cent; iron, 20 to 5 per cent; silicon, less than 25 per cent; carbon, 0.35 per cent. Silicon-spiegel contains manganese, 20 to 50 per cent; iron, 67 to 43 per cent; silicon, 4 to 10 per cent; and carbon, 1.5 to 3.5 per cent. The introduction of manganese into steel not only improves the rolling and forging qualities of the steel but adds greatly to the physical qualities. The deoxidizing and desulphurizing properties of manganese are not found in the same degree in any other metal. These outstanding characteristics are the properties for which manganese finds its principal use. At present no substitute is known. Where certain grades of steel high in manganese and low in carbon are desired, ferromanganese must be used; four times as much spiegel as ferromanganese would be required, and the deleterious impurities in the spiegel would be increased fourfold by the use of this alloy. These alloys are not interchangeable. Only ferromanganese can be used in the manufacture of the high-grade low-carbon steels known in the trade as soft grades. The use of spiegel is prohibited. Soft grades are used in the manufacture of plates, shapes, and structural bars. By far the larger proportion of manufactured steel is required for these uses. As to military needs, only high-grade alloy can be used to meet the ordnance requirement for armor-piercing projectiles and steel requiring highly polished surfaces.

Ores for chemical use.—Ores that are amenable to the requirements established for chemical uses fall into several classes. In the manufacture of dry cells the amount of oxygen available determines

[2] $MnCO_3$ contains 47.56 per cent metallic manganese; remainder is CO_2.

the value of the material. Before the war the specifications in the United States were that the crude ore must contain as a minimum 85 per cent of MnO_2, less than 1 per cent of iron, and no copper. During the war these requirements were greatly modified, and ores containing as low as 65 per cent of MnO_2, less than 1 per cent of iron, and less than 0.05 per cent of copper, nickel, and cobalt were utilized. Since the war, probably because of the difficulty of obtaining foreign high-grade peroxide ores, the standard requirements have been lowered and ores of the Philipsburg (Mont.) district have been largely utilized. These ores have a low dioxide content, but because of their porosity they have been able to meet successfully the competition of foreign ores. For other chemical uses—such as oxidizing agents where the manganese dioxide is employed in the manufacture of chlorine and bromine, as a decolorizer in glass manufacture, in driers for varnish and paint, and in the manufacture of potassium and sodium permanganates—high-grade ores are required, although they are not as essential as for the uses heretofore mentioned.

FOREIGN RESOURCES AND COST OF PRODUCTION

Manganese ore produced in the principal countries, 1921–1925, in metric tons

[Prepared by L. M. Jones, of the Bureau of Mines]

Country	Percentage of manganese	1921	1922	1923	1924	1925
North America:						
Canada		62	66		530	
Costa Rica	37–48	[1] 589	[2]	[2]	[2]	[2]
Cuba	36–48	2,930	4,351	19,636	25,310	23,758
Mexico	40+			2,246	[3]	[3]
Newfoundland		[4] 384				
Panama [5]	50±		[6]	406		
United States—						
Continental (exclusive of fluxing ore)	35+	13,748	13,619	32,006	57,422	99,902
Porto Rico [1]	35+	[3]	[3]	2,799	4,698	4,260
South America:						
Brazil [1]	38–50	275,694	340,706	235,831	159,229	311,882
Chile	40–48	23	900	4,287	4,243	[3]
Europe:						
Austria		[7]	[7]	[7]	[7]	[7]
Czechoslovakia		43,541	23,557	42,043	79,133	[3]
France	30+	3,519	5,224	5,993	3,680	3,185
Germany	30+	3,385	5,532	10,245	3,554	[3]
Hungary	30			403	1,217	[3]
Italy	30–50	4,558	4,529	9,605	12,189	14,984
Portugal	38–70	353	239	[3]	[3]	[3]
Rumania	42	3,035	5,392	12,511	6,482	[3]
Russia	41–48	[1] 28,819	[8] 90,739	[8] 240,885	[8] 500,693	[8] 816,507
Spain	29+	20,098	25,455	28,615	20,840	36,072
Sweden		6,253	4,528	5,203	10,885	[3]
United Kingdom	30+	522	254	2,053	2,496	[3]
Yugoslavia		910	1,122	5,145	4,570	2,716
Asia:						
China [1]		25,627	19,230	27,672	38,538	43,260
Dutch East Indies	45–52	2,093	3,233	5,243	8,482	10,000
India	47–52	690,189	482,015	706,210	815,894	[1] 613,895
Japan	50+	3,881	4,440	5,494	7,585	[3]

[1] Exports.
[2] It is reported that no work has been done on the manganese deposits since 1920.
[3] Data not available.
[4] Exports for year ended June 30 of the year stated in heading of column.
[5] Imports into the United States. Figures for production and exports not available. Figures for 1923 represent manganese content of ore.
[6] Less than 1 ton.
[7] Estimated manganese content of manganiferous iron ore produced was as follows: 1921, 13,345 tons; 1922, 19,947 tons; 1923, 24,033 tons; 1924, 15,007 tons; 1925, 21,387 tons.
[8] Figures for the operating year ended Sept. 30.

Manganese ore produced in the principal countries, 1921–1925, in metric tons—Con.

Country	Percentage of manganese	1921	1922	1923	1924	1925
Africa:						
Algeria [1]		1,893		651	406	450
Egypt		55,065	104,143	132,384	150,194	(2)
Gold Coast	50+	7,311	67,174	[1]141,875	[1]259,441	[1]330,000
Tunisia	42+	1,500	180	1,153	3,220	1,655
Union of South Africa	40–60	287	157	393	530	454
Oceania:						
Australia—						
New South Wales		3,571	2,436	2,597	4,457	1,183
Queensland		846	68	75		
Victoria		10	152			
South Australia		1,622	649	171	321	
Western Australia [1]		16	18	22	20	
New Caledonia		4,200	1,083	64		

[1] Exports. [2] Data not available.

GENERAL STATEMENT

Since 1914 the world's resources of manganese have been augmented by the discovery and development of the Dagwin concessions of the Gold Coast of West Africa. At present the world resources, if graded as to their economic value, would rank as follows: Russia, India, Gold Coast, and Brazil. In these countries the reserve of what now is considered to be commercial manganese ore exceeds 200,000,000 tons. The production of the Caucasus, the Nikopol deposits, and other producers are included in figures for Russia. Of the total Russian production up to and including 1925 the Caucasus has supplied approximately 88 per cent.

During the five years from 1909 to 1913, inclusive, the world's average per annum production was 1,910,000 metric tons. Of this tonnage Russia produced 45 per cent, India 38 per cent, and Brazil 10 per cent.

In 1918 the world's production was 2,103,000 metric tons. Russia produced 20 per cent, India 25 per cent, Brazil 19 per cent, and the Gold Coast 1 per cent.

In 1924 the world's production was 2,187,000 metric tons. Russia produced 23 per cent, India 37 per cent, Brazil 7 per cent, and the Gold Coast 12 per cent.

In 1925 the world's production was approximately 2,570,000 tons. Russia produced 32 per cent, India 24 per cent, Brazil 12 per cent, and the Gold Coast 13 per cent.

THE CAUCASUS

NIKOPOL

The Nikopol deposits are north of the Caucasus in the Government of Ekaterinoslav. Harder has estimated that they contain upwards of 7,400,000 tons. Herbert K. Scott states that this figure is but a fraction of the whole.[3] For many years these deposits supplied the domestic needs of Russia. During and since 1924 they have largely supplied the demands of Germany.

[3] Scott, H. K., Discussion of paper by E. C. Harder: Trans. Am. Inst. Min. and Met. Eng., vol. 56, 1916, pp. 68–74.

GEORGIA

South of the Caucasus, in Georgia, are more than 40 known occurrences of more than academic interest. By far the most important, in respect to quality, quantity, and availability, are those in the Kutais district, generally known as the Tchiaturi deposits. In 1913 the Tchiaturi deposits produced 969,967 metric tons, or 41 per cent of the world's production of 2,365,000 metric tons.

The development of the industry is hampered by faulty organization, primitive and wasteful mining methods, and lack of adequate transportation facilities. In 1914 there were more than 5,000 concessionaires at work in this district. In the past, the lack of organization already mentioned did not control production but rather sharpened competition between the producers—Russians, Georgians, Greeks, Armenians, Turks, French, Italians, British, and Germans. Up to the present there has always been an excess of production in this district, except in years disturbed by political upheavals. The mining of manganese has not been particularly profitable but has merely given the population so engaged the means of eking out an existence. Before the World War less than $2 a ton net over and above the cost of production remained to be divided between the producer and the ore buyer and for the expenses incidental to selling.

Geology and origin.—The Tchiaturi deposits are bedded ores of sedimentary origin in flat-lying rocks of Cretaceous and Tertiary age. They originally extended over an area of about 55 square miles, but the southwest part of the deposits has been removed by erosion and the remaining part has been divided into eight separate bodies which have an aggregate area of approximately 22 square miles. The intervening valleys are ¼ to over 1 mile wide and 700 to 1,000 feet deep. The ore bed rests on thick calcareous sandstone, and the outcrop lies 400 to 800 feet below the hilltops. The sandstone immediately above the ore commonly forms a cliff 30 to 50 feet high. The ore body is distinctly stratified, showing compact layers of dense ore and oolitic granular nodules composed largely of pyrolusite with wad and psilomelane. In appearance the outcrop resembles a horizontal bed of coal. Near the southwest end of the deposit on Perevissi Hill evidence is found of an old volcano that was presumably the source of the lava that caps this hill. It is believed that the genesis of the deposit is not connected with these eruptive rocks.

Reserves.—The reserves have been estimated by D. Ghambashidze[4] to be more than 200,000,000 tons; by Datico Zereteli[5] as 146,000,000 tons; by Beyschlag, Krusch, and Vogt[6] as 110,000,000 tons; by Herbert K. Scott[7] as 22,125,000 tons of recoverable ore; by the writer on the basis of unpublished reports, checked by him with data collected in Georgia in 1920, as 40,000,000 tons of recoverable ore.

Mining and beneficiation. A factor that influences the glaring differences in the various estimates cited is the difference between the amount of ore in place and the amount that is recoverable. Fully 90 per cent of the ore in place is fine, and a large proportion of it is

[4] Mineral Resources of the Caucasus. London, 1920, p. 21.
[5] Zereteli, Datico, Manganese Ores, with Special Reference to the Georgian Ores. London, 1925, p. 82.
[6] Beyschlag, F., Krusch, P., and Vogt, J. H. L., The Deposits of Useful Minerals and Rocks. London, 1916, vol. 2, p. 1105.
[7] Scott, H. K., Discussion of paper by E.C.Harder: Am. Inst. Min. and Met. Eng., vol. 56, 1916, p. 69.

lost in mining and beneficiation. The mining method employed and the inefficiency of the laborers have resulted in much waste. Blasting is not necessary in mining; the only equipment needed is pick and shovel. With few exceptions the ore is drifted out and no timber is employed; in consequence there is caving and a material loss of ore. Where pillar methods of mining are employed the pillars are robbed from time to time, which also results in caving with corresponding losses of ore. In 1910 the German interests introduced the longwall system of mining, by which slightly more than 90 per cent of the ore in place was recovered—a relative gain of 40 per cent over all methods then in vogue. In 1920 this system had not been generally adopted, as it entailed what the miners believed to be unnecessary additional work. It was far easier for them to limit the expense of the working by the length of a wheelbarrow runway, and they could see no reason for providing cars and tracks, to say nothing of gobbing the drifts. The ease with which this deposit can be mined may be appreciated by considering the character of the deposit.

In the past the ore has been beneficiated by selective mining, hand sorting, screening, and washing. Perevissi Hill is an exception. The ore produced from this area averages 50 per cent Mn. as broken. Over a large part of the field the ore as mined averages 42 per cent. Hand sorting and screening raise the grade to 45 or 47 per cent. Washing raises the grade to 52 per cent plus, with a loss of 40 to 50 per cent of the crude. In 1920 there were 31 washing plants, with a combined capacity of 800,000 tons of product per annum. The output of the district in 1913, when slightly over 1,200,000 tons were shipped, was the highest so far attained. With proper organization and such equipment as existed in 1920, this annual production could be equaled and maintained for many years.

Harriman concessions.—In 1925 the Union of the Soviet Socialist Republics (in which the title now rests) entered into an agreement with W. H. Harriman & Co., of New York, for a 20-year lease on the Tchiaturi deposits, excluding Perevissi Hill. This lease calls for the payment of $62,350,000 during its life. The lessees are required to broadgauge the railway from the mines (Chiatouri to Sharopan), a distance of 25 miles; to rebuild the trans-Caucasian Railway from Sharopan to Poti, 82 miles; to improve the harbor at Poti; and provide modern rolling stock for the railway and adequate loading facilities at port. The harbor at Poti is artificial and was constructed during the old Russian régime. A bar that has formed across the entrance permits only 4,000 tons to be shipped at any one time. The dockage facilities allow five 10,000-ton boats to be loaded simultaneously.

There is a requirement under the contract in reference to the impounding of the fines, which heretofore have been discharged into the Kvirila River from the beneficiation plants. The pollution of the river has occasioned innumerable lawsuits in the past. The clause mentioned may have been inserted not only to increase the recovery of the manganese but to obviate the nuisance mentioned. Not only are settling tanks required, but the contract calls for the installation of adequate machinery, such as Dorr thickeners to treat the tailings.

The contract requires a minimum royalty tonnage of 1,150,000 tons during the first three years—300,000 tons the first year, 400,000

tons the second, and 450,000 tons the third—and not less than 500,000 tons per annum thereafter during the entire life of the lease, at a royalty of $4 per ton. During the first three years a minimum equivalent to 210,000 tons—70,000 tons per annum—of peroxide ore (chemical ore) is to be paid for on the basis of $8 per ton royalty; thereafter $9 a ton royalty applies. The average royalty per ton to be paid the Government of the Union of Soviet Socialist Republics for all manganese for the minimum royalty tonnage of 1,150,000 is therefore $4.62. In addition to the royalty mentioned, a royalty of 50 cents per ton on metallurgical ore and $1 per ton on chemical ore, covering the first 600,000 tons shipped, and 25 per cent of the profits derived by the Harriman company thereafter is to be paid the Manganese Producers Association, former owners of the manganese properties in the Soviet Socialist Republics of Georgia. The Manganese Producers Association and the existing government were known as the "Society of Tchemo" and were members of the Société d'Exportation de Manganese de Tchiatouri. During the first three years the aggregate royalty is approximately $5.21. Because of the many qualifying clauses of the agreement and the various conditions stipulated, the royalties vary, and the figure assumed is only relatively correct. On September 1, 1925, the Harriman company took over the stock of ore on hand at Poti, amounting to 290,000 tons (chiefly unwashed), and 250,000 tons on the loading platform at Chiatouri.[8] The lessees have arranged with the Georgian Manganese Co. for the delivery by July, 1926, of 600,000 tons.

Prices and costs.—The average pre-war price of manganese was 17 cents a unit delivered in a foreign port. The costs in 1898 were given by Drake[9] as follows:

Cost per gross ton in 1898

Cost of production at mine	$0. 92
Transportation from mine to Chiatouri	. 71
Loading, storage, and transferring at Chiatouri and Sharopan	. 36
Freight from Chiatouri to Sharopan	3. 28
Freight from Sharopan to Poti	. 52
Unloading, storage, etc., at Poti	. 29
Port duty	. 16½
Total	6. 24½
Ocean freight, insurance, sampling, etc.	3. 15
	9. 40

The average price in 1918 for Caucasian ore of 50 per cent tenor, c. i. f. England, was $9.59 per ton. Since the war the price of labor has not increased materially. It seems fair to assume that the present cost at the mine would be in the neighborhood of 90 cents per gross ton. Under the Harriman concessions the freight rate has been set for the first three years at $1.80 per ton to Poti. At the end of the three-year period the price is to be 80 cents per ton for the same haul. In 1920 it was estimated that the cost of delivering the ore from the mines to the loading platform at Chiatouri would be around 75 cents. Port charges were 6 cents per ton and the loading at Poti 20 cents per ton. The ocean freight rate to the Atlantic seaboard of

[8] Mining Journal (London), "Georgian manganese and the market outlook": Vol. 90, Sept. 19, 1925, p 730.

[9] Drake, Frank, "Manganese industry of the Caucasus": Trans. Am. Inst. Min. Eng., 1898, p. 207.

the United States has been estimated at $4 per ton and the present aggregate royalties at $5.21 per ton. On the basis of an annual production of 500,000 tons, the interest on the investment at 5 per cent would be 50 cents per ton. Beneficiation of the ore at the rate of $1 per ton makes an apparent total cost of $14.42. To this total must be added a duty of 1 cent per pound, or $11.20 on the basis of 50 per cent, if the ore is shipped to the United States, thus raising the total to $25.62, or a cost per unit on a 50 per cent basis of 51.2 cents. The present (July, 1926) world price of manganese is 32 cents plus duty, or 54.4 cents per unit. The present profit on 50 per cent Caucasian ore sold in the United States would therefore be 3.2 cents per unit, or $1.60 per ton.

The Harriman concessions were granted on June 12, 1925, but did not become effective until July 25, 1925. From the date on which the concessions became operative to December 31, 1925, 184,426 tons of metallurgical ore, containing 48 to 54 per cent of manganese, and 2,702 tons of chemical ore, containing from 80 to 90 per cent of manganese dioxide, or a total of 187,128 tons, were produced.

Manganese ore exported by the Georgian Manganese Co. (Ltd.) (Harriman concessions), July 25 to December 31, 1925, by destinations, in gross tons

Destination	Metallurgical ore	Chemical ore	Total
United States	120,070	----------	120,070
Germany	5,856	2,264	8,120
France	1,988	----------	1,988
Italy	13,474	15	13,489
England	8,023	104	8,127
	149,411	2,383	151,794

INDIA

In 1907 Fermor, of the Geological Survey of India,[10] estimated the reserves in a statement that at current rates—an annual production of 600,000 tons—the deposits then known would last 30 to 50 years, and that in addition millions of tons of 30 to 40 per cent ore would remain. Before 1919 virtually all the ore produced in India was mined by the open-cast or quarry method. During the five years 1919 to 1923 underground mining began at Kandri, Gariajhor, and underground development work started at the Balaghat mine. Because of the size of the deposits the major part of the ore won will for many years unquestionably be mined from open pits. There are three types of deposits from which all production comes—the "gondite," "kodurite," and "lateritoid." By far the largest percentage of the production comes from the "gondite" ores, which are supposed to have been formed by metamorphism of a series of sediments. These sediments are partly mechanical (sands and clay) and partly chemical (manganese oxide).[11] After metamorphism the sands and clays became quartzites, phyllites, and mica schist; the pure portions of the manganese oxide sediments were transformed to crystalline manganese ores. The depths to which these bodies extend are

[10] Fermor, L. L., "The manganese ore deposits of India": India Geol. Survey Mem., 1909, vol. 37, p. 457.
[11] Fermor, L. L., "Records India Geol. Survey": Vol. 57, 1925, p. 229.

unknown. Fermor has assumed that they may extend more than 500 feet. As development and mining have gone deeper in deposits of this character, a noticeable decrease in manganese content and an increase of iron and phosphorus have become evident. It may therefore be assumed that the present cost of producing manganese will remain relatively constant, with a probable increase at a gradual ratio as underground mining becomes necessary.

The production of manganese ore in India began in 1892 with a yield of 674 tons in the Vizagapatam district, Madras Presidency. Since 1900 the production has been relatively constant, but shipments have fluctuated with the world's production of steel. A lag of a year between these fluctuations, however, causes the stocks to accumulate from time to time. Because of the higher ratio of iron to manganese the ore mined is not as desirable for the manufacture of ferromanganese as that of Georgia, but its physical qualities are far superior. India has enjoyed the advantage of a reputation for producing a more uniform grade of material than any other source. Reliance can thus be placed upon the fulfillment of requirements as to grade. In the early days of mining in Georgia an ore buyer could never be sure what grade of material he would receive. The items that make up the total cost of producing a ton of ore are given in the Memoirs of the Geological Survey of India, 1909, as follows:

1. Cost of mining, labor, tools, establishments.
2. Cost of transportation to railway.
3. Cost of handling to port of shipment.
4. Cost of handling at port of shipment.
5. Cost of shipping to Europe or America.
6. Destination charges.
7. Royalties to Government.

The average cost based on these items is given for the Central Provinces via Bombay as Rs.27, a.8, Vizagapatam Rs.24, a.0. These figures are the total cost per ton on a 50 per cent basis c. i. f. London; in United States currency they equal \$8.84[12] per ton or 17.68 cents per unit for the Central Provinces and \$7.78 per ton or 15.56 cents per unit for Vizagapatam, an average of 16.62 cents per unit for the two districts. During the five years preceding 1914 the average cost per unit of manganese was 16½ cents in German ports, 16 cents in English ports, and 17$\frac{1}{10}$ cents in American ports. Since 1914 mining costs have increased about 70 per cent, but this increase has been more than offset by the higher price of manganese ore. At present ore can be delivered c. i. f. Atlantic seaboard, United States, at an approximate profit of 20 cents per unit.

Exports from British Indian ports in 1925 are shown below. Exports of British Indian ore from Portuguese India were 134,653 tons.

To—	Gross tons
United Kingdom	180, 472
Germany	30, 258
Belgium	175, 334
France	150, 585
Italy	16, 875
United States	49, 164
Other countries	1, 510
Total	604, 198

[12] Rupee figured at 32.44 cents.

BRAZIL

In 1888 manganese ore was discovered in the State of Minas Geraes and since then in many districts. The total exports through 1925 slightly exceed 6,000,000 tons; but fully 95 per cent of the total has come from two districts—the Nazareth district in the State of Bahia and the Lafayette district in the State of Minas Geraes.

The deposits of the State of Bahia are about 16 miles from tidewater, are of the residual type, and consist largely of nodules of pyrolusite and psilomelane. The grade of the ore ranges from 40 to 49 per cent of manganese, 3 to 4 per cent of silica, 0.016 per cent of phosphorus, and 2 to 3 per cent of moisture. The reserves of Bahia are relatively small.

In the Lafayette district, there were three regular producers before 1920—the Wigg mine or the Morro de Mina, Minerazao de Agua Preta, and the Companhia Tueluz de Mina. In 1920 these properties were consolidated and are now known as the Morro de Mina; they are estimated to contain more than 15,000,000 tons of ore. They are slightly more than 300 miles from tidewater (Rio de Janeiro). The major part of the output from this district has been from the detrital deposits, a source that is economically exhausted, and for the past few years the production has come from ore in situ. The grade of the detrital ores is 50 per cent of manganese, 3 per cent of iron, 5 per cent of aluminum oxide, 3.5 per cent of silicon, and 0.069 per cent of phosphorus. The ore now being shipped is said to contain more than 7 per cent of aluminum oxide, a higher per cent of iron than formerly, and 40 to 45 per cent of manganese.

It is doubtful if Brazil, in times of peace, will be able to produce as large a part of the world's consumption as she has in the past. The chief factors that militate against a large production are: The insistence of the Brazilian Government that the reduction of raw material take place within its boundaries; the relatively high taxes, state and export; the distance of the major sources from seaboard, entailing a high cost of transportation; the exhaustion of developed deposits of easily mined high-grade ores; and the necessity of adopting selective mining to a greater degree than is practiced in other countries in order to maintain the required grade, and the consequent increased cost. Although the physical qualities of the Brazilian ore are desirable, they do not offset the increase of alumina and the decrease of manganese content. Brazil's production is not needed to supply the world's consumption. It seems highly probable that in spite of the reserves, actual and potential, the Brazil deposits will be economically exhausted within the next few years at least.

Mining costs in Brazil compare favorably with costs in Russia and India. From 1916 to 1920, inclusive, a total of 2,088,835 metric tons was shipped, or a per annum rate of 417,767 tons. The major part of this ore was produced from the Morro de Mina mine, Minas Geraes district. In order to supply the needs the residual deposits were rapidly exhausted, and ore in place had to be mined by open cuts and underground methods. On a basis of ore carrying 50 per cent of manganese, the cost of mining and delivery before 1914 was 18.6 cents per unit in German ports, 16 cents per unit in English ports, and 17.2 cents per unit in American ports. In 1918 the costs per ton of the ore from Morro de Mina mine were as follows:

Mining, f. o. b. cars	$4.00
Export tax	1.85
Railway freight rate to Rio de Janeiro	1.50
Dock charges at port	.65
Ocean freight rate	15.00
Total	23.00

The export tax is figured on the basis of 48 per cent of manganese, according to the Brazilian custom.

The following schedule of taxes was promulgated June 25, effective July 1, 1925.[13]

Schedule of taxes

Product	Valuation (milreis)	Export tax
	Per ton	*Per cent of valuation*
Special manganese, above 52 per cent content	150	12
First-class manganese, 49.1 to 52 per cent content	130	12
Second-class manganese, 46.1 to 49 per cent content	100	12
Third-class manganese, 44.1 to 46 per cent content	80	12
Fourth-class manganese, 40.1 to 44 per cent content	49	10
Fifth-class manganese, 30.1 to 40 per cent content	39	8

For purposes of taxation, minerals that contain less than 30 per cent are considered iron ores. In addition to the duties mentioned, a tax of 1 to 3 francs (French gold francs), varying with the official valuation, is levied on exports through Rio de Janeiro.

On October 3, 1925, the paper milreis was worth 14¼ cents. The Department of Commerce says that the tariff mentioned is in paper currency, in spite of the fact that the custom of Brazil in collecting duties is to base the sum so collected on 60 per cent gold milreis and 40 per cent paper currency. The milreis referred to above is based entirely on paper milreis—14¼ cents.

The export tax given in per cent of valuation, interpreted in dollars, would be:

Ore:	
Special manganese	$2.57
First-class manganese	2.22
Second-class manganese	1.71
Third-class manganese	1.37
Fourth-class manganese	.70
Fifth-class manganese	.44

Since 1918 the cost of production at mines and freight rates from mine to seaboard have not declined; the ocean freight rate has fallen to about $4, and Government export tax has been slightly increased. The high mining costs are probably due to the amount of material that must be handled to produce 1 ton of standard-grade ore.

The quantity exported in 1925 and its destination were as follows:

To—	Metric tons
Belgium	10,185
United States	240,537
Great Britain	6,000
Holland	34,383
All others[14]	20,777
Total	311,882

[13] Commerce Reports, Oct. 5, 1925, p. 53.

[14] Includes shipments from Bahia for which the countries of destination are not available.

GOLD COAST

DAGWIN MINE

In 1914 the government geologist of the Gold Coast colony, A. E. Kitson, discovered what is now known as the Dagwin manganese mine.[15] The first shipment of ore (174 tons) was made in September, 1916. In 1924 the shipments amounted to 259,441 metric tons and in 1925 to approximately 330,000 tons. The grade of the ore and the quality are comparable to those of the Georgian washed ores. Shipments analyze as follows: Manganese, 50 to 53 per cent; iron, 2 to 4 per cent; silica, 3 to 7 per cent; and phosphorus, 0.1 to 0.12 per cent. The minerals found are mainly psilomelane, pyrolusite, and manganite. At present the property is under lease to the African Manganese Mining Co. (Ltd.), which has equipped it with modern facilities for extracting the ore and has erected modern equipment for loading at the port of Sekondi, an open roadstead 33 miles from the mine.

A considerable amount of development work has resulted in a proved tonnage of 10,000,000 tons. The indicated or prospective tonnage is more than double this amount. The mode of the occurrence of the ore, the ease with which the deposit may be mined, and the abundance of cheap labor indicate that this deposit may become the lowest cost producer of all the now known large manganese resources.

The average analysis of the shipments so far made from the Dagwin mine has been manganese, 52 per cent; iron, 4.6 per cent; silicon, 4 per cent; and phosphorus, 0.11 per cent. The actual costs f. o. b. mine are less than $1 per ton. The cost of transportation 33 miles over the Government railway has been 6s.—roughly, $1.50 a ton—plus 1s. harbor dues. In addition to these charges lighterage cost 2s., or 50 cents per ton. In 1923 the Government freight rates were reduced, and modern facilities were installed at the port of Sekondi. The early shortage of labor has been overcome.

In addition to the detrital deposit mentioned, massive outcrops have been traced along the crest of a ridge virtually without a break for 2½ miles. About 500 yards northeast of the 33-mile post of the Seccondee-Coomassie Railway an adit 220 feet below the crest of the ridge has cut 60 feet of high-grade ore. Drifts have been driven in solid ore, and crosscutting shows that the width is maintained. The Extension of the Dagwin Concessions claims to have a body of high-grade ore proved for a length of 2,200 feet and a probable width of more than 50 feet. Other ore bodies of commercial grade are known on this property.[16] Probably these properties will be able to produce high-grade manganese for many years at a figure substantially lower than that of India, the Caucasus, or Brazil.

OTHER DEPOSITS (NORTHWEST TERRITORY)

In addition to the deposit now developed, there are other deposits of high-grade manganese, said to be very large, in the Northwest Territory some 300 miles from the coast. Actual figures on the cost of production are not available, and the costs as given are based upon

[15] Ford, S. H., "Manganese West Coast of Africa": Min. Mag. (London), vol. 17, 1917, p. 271.
[16] Imperial Mineral Resources Bureau, Mineral Industry of the British Empire and Foreign Countries: War Period; Manganese: 1913–1919, pp. 35-36.

the occurrence of the ores. The ore that is being mined is a detrital deposit 18 inches to 15 feet thick. The overburden is very slight. It has been estimated that 3,000,000 tons of detrital ore are recoverable.

The larger part of the output has been shipped to Norway, where it has been manufactured into ferromanganese. A cargo or so was shipped to Canada in 1925. Approximately 60,000 tons of crude ore, figured on a 50 per cent manganese content, were shipped to the United States.

CUBA

During the year there have been no important changes in the manganese industry of Cuba. The exports to the United States in 1925 are estimated to be 23,000 gross tons.

SINAI PENINSULA

As a producer of ferruginous manganese ore, the Sinai Peninsula [17] has attained world importance. The manganiferous ores in this locality seem to occur along or near fault planes. The largest deposits are known as the Um Bogma. The manganese and iron of this district occur as irregular deposits, somewhat tabular or lenticular, at the base of the Carboniferous limestone series. The chief deposits occur in four groups of hills, which have been named Central, East, North, and South.

CENTRAL HILLS

A bedlike deposit of ore averages from 2 to 3 meters and in places is as much as 4 meters in thickness and extends through the greater part of the Central Hills. Headings driven into the bed from the two sides of the hill, occasionally to a distance of over 40 meters, show that the ore exists in a nearly horizontal sheet with sandstone below and ocherous sandy clay above. The ore is mostly rather soft and varies from almost pure pyrolusite to ocherous hematite. There is also some psilomelane. The largest body opened on this hill is the Wadi Shellal. A fine mass of ore has been followed into the hill for 27 meters, where it is cut off by a fault; and the extension of this level, which has been driven 36 meters into the hill, is entirely in ocherous sandstone. The ore mass increases in thickness to over 3 meters at the fault, then ends as sharply as if cut off by a knife, and the ocherous sandstones against it are bent upward for a few centimeters at the fault plane, showing that the downward throw of the fault is to the east. If the ore extends on the other side of the fault, it would probably be found by sinking a few meters in the floor of the heading.

EAST HILLS

The northern scarps of the eastern group of hills exhibit an almost continuous outcrop of ore at the same horizon as that of the Central Hills. At Wadi Hasania Pass two shafts have been sunk near the north end of the plateau, each going through the dolomite and shale into soft manganese ore. The deposit seems to be continuous through the northern part of the hills, and here again it is observable that the maximum thickness is near a fault.

[17] Ball, J., Geography and Geology of West-Central Sinai: Survey Dept. Egypt, 1916. Hume, W. F., and Barron, T., Topography and Geology of the Peninsula of Sinai: Survey Dept. Egypt, 1906–1907.

NORTH AND SOUTH HILLS

The North Hills have not been extensively prospected.

Highly ferruginous beds with patches of hard and soft manganese ore can be traced around a large part of the southern group of hills. Prospectors' excavations show that the ore deposits here are thinner and poorer in manganese than those of the other groups of hills mentioned. The ore-bearing bed is about 2 meters thick, consists of red, sandy, and ocherous shale, with patches of soft manganese ore, and is overlaid by variegated sandy shales.

These deposits were taken over by the Sinai Mining Co. (Ltd.) in 1910 and were equipped on the basis of an annual production of 300,000 tons. A narrow-gauge railway 10 miles long was constructed from the port of Abou Zenima and an aerial tramway 6 miles long from the terminus of the railway to the mines at Um Bogma. At Abou Zenima a pier, landing appliances, and moorings suitable for ships not exceeding 10,000 tons burden were constructed. In 1914 operations were suspended; much damage was done by Turkish troops, and the company buildings at the port were destroyed in February, 1915. The works have since been restored, and production from the property was begun in 1918.

Manganese ore produced at Um Bogma mines, 1918–1924, in metric tons

1918	27,498	1922	104,143
1919	48,743	1923	132,384
1920	77,562	1924	150,194
1921	55,065		

Average analysis of manganese ore[18] *from Um Bogma mines*

	Per cent		Per cent
Manganese	32.36	Barium sulphate	3.29
Iron	25.08	Phosphorus	.126
Silica	2.79		

The reserve tonnage of these mines is conservatively estimated at 12,000,000 tons.

The ochers associated with the ores are used as pigments.

RÉSUMÉ

The four great sources of manganese—Russia, India, Brazil, and the Gold Coast—can easily produce 2,500,000 tons of high-grade ore a year, thus giving a great surplus of about 700,000 tons. Outside of these four countries the sources of the balance of the world's production are of minor importance.[19]

Great Britain controls the Indian and Gold Coast deposits. Citizens of the United States have commercial control of the Caucasus, and a corporation of the United States controls the largest developed source in Brazil. Normally the United States uses slightly more than one-third of the world's consumption and depends upon foreign sources for 90 per cent of its manganese ores. For many years before the World War the world's price of manganese ore was around 20 cents

[18] Imperial Institute, Monographs on Mineral Resources, with special reference to the British Empire, Manganese Ores: 1919, p. 51.

[19] Hewett, D. F., Manganese and Manganiferous Ores: Mineral Resources, 1918, pt. 1, 1921, pp. 646–650.

per unit. Since 1922 it has slightly exceeded 40 cents. Reorganization of the manganese producers of the Caucasus and development of the Gold Coast deposits will unquestionably occasion a struggle to control the world's market. For many years India has supplied about 30 per cent of the world's consumption and has maintained this ratio. Although the Caucasus has mined more cheaply than any other source, this slight advantage in cost has been offset by inferior physical qualities, and India and the Caucasus have competed most keenly. With the entrance of the Gold Coast into the world's markets, evidence points to the curtailment of the Brazilian and Indian output.

Costs in these three countries are so nearly identical that it is doubtful whether any one of them or a combination of any two could eliminate the third from supplying part of the world's demand. Temporarily, at least, the Caucasus will be forced to reduce the price to insure sales of enough ore to satisfy the minimum royalty required in the agreement under which the concessionaires operate. In consequence, the selling price must fall to a point approaching that which existed before the World War.

Deposits of high-grade manganese ore recently discovered in the Postmasberg district, in the Bechuanaland Protectorate, South Africa, will, if development results as promised, exert a decided influence upon the world's price of manganese. The deposits are said to be very large and the grade of ore high. The outlet will probably be Lüderitz, Southwest Protectorate.[20]

UNITED STATES

PRODUCTION

Manganese alloys and ore produced in the United States and imported from principal foreign sources, 1917–1925, in gross tons

Year	Steel (production)[a]	Ferromanganese		Spiegeleisen		Manganese ore				
		Shipments	Imports	Shipments	Imports	Shipments[b]	Total imports	Imports from—		
								Russia	India	Brazil
1917	45,060,607	260,225	41,969	189,241	3,968	129,351	629,972	----------	48,975	512,517
1918	44,462,432	366,076	27,168	263,861	1,169	305,869	491,303	----------	29,275	345,877
1919	34,671,232	198,255	33,022	90,855	27	54,987	333,344	6,916	9,200	246,592
1920	42,182,934	276,594	59,254	103,672	5,234	94,420	[c]599,764	18,762	71,238	421,523
1921	19,783,797	111,374	9,077	69,230	307	13,531	[c]392,606	----------	113,730	262,468
1922	35,602,926	161,612	[d]100,725	70,253	8,151	13,404	[d]425,000	{--------- [f]1,642	[e]24,250 [f]298	[e]234,598 [f]40,595
1923	44,943,696	226,365	[d]113,833	134,086	4,668	31,500	[d]419,000	[g]11,670	[g]25,568	[g]88,036
1924	37,931,939	232,821	[d]56,588	76,179	7,433	56,515	[d]505,000	[g]41,097	[g]54,566	[g]54,938
1925	45,393,524	254,005	[c]78,713	95,850	1,090	98,324	[d]615,000	[g]114,537	[g]23,504	[g]109,650

[a] According to American Iron and Steel Institute.
[b] Exclusive of small quantities of ore shipped for use in fluxing.
[c] Exclusive of 7,173 tons in 1920 and 8,748 tons in 1921 reported by Bureau of Foreign and Domestic Commerce as manganese ore. The value of this "ore" ranged from $46 to $292 a ton; consequently the Bureau of Mines believes that the figures represent imports of ferromanganese, spiegeleisen, manganese chemicals, and perhaps some chemical ore.
[d] Prior to Sept. 22, 1922, the Bureau of Foreign and Domestic Commerce reported the gross weight of manganese ore and ferromanganese imported, but since that date has reported only the manganese content. This figure is a Bureau of Mines estimate of the gross weight of ore or alloy imported. For the figures reported by the Bureau of Foreign and Domestic Commerce, see the tables on pp. 184 and 189.
[e] Jan. 1 to Sept. 21, 1922. Figures represent gross weight of manganese ore imported.
[f] Sept. 22 to Dec. 31, 1922. Figures represent manganese content of ore imported.
[g] Figures represent manganese content of ore imported.

[20] Mining Journal (London), "South Africa": Feb. 6, 1926, p. 110.

Manganese and manganiferous ore (exclusive of fluxing ore) shipped from mines in the United States, 1919–1925, by States

State	Ore containing 35 per cent or more of manganese			Ore containing 10 to 35 per cent of manganese			Ore containing 5 to 10 per cent of manganese		
	Shippers	Gross tons	Value	Shippers	Gross tons	Value	Shippers	Gross tons	Value
1919									
Metallurgical	39	34,882	$993,955	24	211,632	$965,660	9	112,303	$352,570
Chemical	3	20,075	797,163						
1920									
Metallurgical	54	79,593	1,856,692	31	357,279	1,450,518	6	279,687	644,572
Chemical	2	14,827	539,543						
1921									
Metallurgical	10	2,300	47,116	6	8,439	42,755	3	62,670	147,576
Chemical	4	11,231	447,981						
1922									
Metallurgical	15	2,898	50,195	9	344,674	1,071,780	6	251,614	632,039
Chemical	3	10,506	404,965						
1923									
Metallurgical	32	11,060	188,748	41	319,666	1,158,628	12	1,072,457	3,598,327
Chemical	4	20,440	686,225						
1924									
Metallurgical:									
Alabama	3	1,242	24,954	9	611	6,722			
Arizona	1	42	798						
Arkansas	6	3,400	60,350	6	7,991	37,170			
California	2	850	(1)						
Colorado	2	5,338	48,042	7	27,058	109,289	1	3,891	(1)
Georgia	8	1,093	18,304	19	14,182	73,684	6	6,353	16,558
Michigan				1	50,556	157,184	1	39,939	(1)
Minnesota				4	159,915	439,132	3	361,527	970,351
Montana	3	11,933	123,456						
Nevada	3	1,310	13,579	3	2,591	15,997			
New Mexico	2	775	(1)	2	23,246	(1)			
Tennessee	2	455	11,611						
Utah				2	116	1,010			
Virginia	2	440	(1)	2	204	(1)			
Washington	1	5,000	100,000						
Wisconsin							1	175,316	606,593
Undistributed			39,920			89,202			120,441
Total metallurgical	35	31,878	441,014	55	286,470	929,390	12	587,026	1,713,943
Chemical:									
Montana	3	23,512	816,463						
Virginia	1	1,125	50,000						
Total chemical	4	24,637	866,463						
1925									
Metallurgical:									
Alabama	2	938	12,544	5	298	3,087			
Arizona	3	294	5,102						
Arkansas	4	3,517	79,335	9	5,076	23,140			
California	3	869	17,525						
Colorado	1	743	5,127	5	7,352	26,565			
Georgia	8	1,649	20,281	20	28,038	133,215	5	7,349	23,397
Massachusetts	1	(1)	(1)	1	(1)	(1)			
Michigan				2	98,753	(1)			
Minnesota				3	77,665	184,121	4	741,409	1,577,301
Montana	4	55,659	585,031						
Nevada	2	850	(1)	1	6,659	(1)			
New Mexico	2	1,588	(1)	2	40,848	153,251			
North Carolina	2	(1)	(1)						
Tennessee	1	352	8,800	1	(1)	(1)			
Utah	1	50	(1)	3	666	5,754	1	496	(1)
Virginia	3	1,499	22,981	1	1,800	(1)			
Washington	1	8,113	(1)						
Wisconsin							1	404,014	(1)
Undistributed		52	198,073		97	386,183			1,198,705
Total metallurgical	38	76,173	954,799	53	267,252	915,316	11	1,153,268	2,799,403
Chemical:									
Montana	3	20,529	825,970						
Virginia	1	1,622	77,000						
Total chemical	4	22,151	902,970						

[1] Included under "Undistributed."

POSITION OF THE UNITED STATES

The United States plays the part of consumer in the world's manganese-ore industry; in fact domestic consumption amounts to approximately 35 per cent of the world's production. No known deposits of notable magnitude have been found within the United States. The country has been carefully prospected, and the chances for discovering large deposits of high-grade ore are extremely slight.

The reserves of ferruginous manganese and manganiferous iron ores are large, and the areas in which a mixture of rhodochrosite and rhodonite carries 15 per cent or more of manganese are very large. The known occurrences of rhodonite and bementite indicate that the reserves of low-grade siliceous ores carrying 10 per cent manganese or more can be measured in hundreds of thousands of tons. Should the problem of rendering the manganese in these ores available for the manufacture of ferromanganese be solved, our dependence upon foreign sources would be minimized greatly.

RESOURCES OF HIGH-GRADE MANGANESE ORE IN THE UNITED STATES

According to records of the United States Geological Survey, there are 1,840 known occurrences of manganese in the United States, but many are of academic interest only. Of the total, 412 have produced ore that contains more than 35 per cent manganese.

Domestic mining of manganese ore began in 1832, when the Paddy Run mine in Nelson County, Va., made the first shipment. From 1885 to 1890 the production of the Crimora mine in Virginia enabled more than 50 per cent of the high-grade ore used in this country to be supplied from domestic sources. From 1900 to 1916 the domestic production was less than 3 per cent of the country's consumption of metallurgical ore. In 1917 and 1918, the World War period, domestic mines supplied 25 per cent of the domestic need. From 1918 to January 1, 1926, with the exception of 1920, domestic production met less than 12 per cent of the domestic requirements. In 1920 the Emma mine of the Anaconda Copper Mining Co. shipped 56,265 gross tons and in 1925 resumed shipments on a large scale, producing 47,469 tons during the year. The sporadic production of the Emma mine may be attributed to mining conditions that make production of manganese ore economical only when the zinc ores, with which the manganese occurs, have been extracted. The domestic production represented by the World War period was made possible only by modifying the requirements as to the tenor of manganese and of undesirable impurities in the ore. Ores containing 35 per cent manganese and those containing high percentages of silica and phosphorus were accepted. The price of ore per ton rose to nearly six times the prewar price.

WAR MINERALS RELIEF

In spite of these conditions, the larger part of the ore was produced at a loss. To compensate the producers of manganese for the losses incurred during the war period, Congress made an appropriation to cover them; the War Minerals Relief Commission examined claims of the producers and made awards.

Manganese production and costs during war period (1917–18)

[Compiled in 1923 by J. W. Furness, of the Bureau of Mines]

State	Production (gross tons), exclusive of fluxing ore				Data based on War Minerals Relief Commission claims										Production cost per ton	Estimated minimum price per ton over 5-year period necessary to justify mining operations	
	Number of deposits, producers, and shippers	35+ per cent	5 to 35 per cent	Number of deposits producing less than 50 tons	Number of claims filed	Production		Claimant's total investment	Number of awards made	Number of tons produced	Total amount of awards	Cost per ton	Amount received per ton	Capital invested per ton		35+ per cent	5 to 35 per cent
						35+ per cent	5 to 35 per cent										
Alabama	7	973	443	4	4	[1] 2,496	----------	$176,506.79	1	2,496	$74,909.61	$57.00	$27.30	$71.00	$60.00	----------	----------
Arkansas	36	17,871	18,273	15	99	10,176	----------	1,059,499.46	50	3,142	148,133.63	68.00	32.10	335.00	90.00	$65.00	----------
Georgia	29	10,293	24,057	5	27	6,449	----------	562,404.98	20	5,829	235,450.60	78.00	38.00	96.80	68.00	55.00	$12.00
Tennessee	24	6,158	2,441	6	39	4,896	----------	642,391.33	15	2,186	54,953.51	51.00	24.60	293.00	70.00	60.00	12.00
Virginia	44	23,288	47,172	8	40	12,864	----------	3,066,733.54	25	9,871	343,222.62	58.00	24.20	305.20	90.00	55.00	9.00
Arizona	42	32,414	4,026	10	26	10,729	----------	342,362.43	8	1,892	69,368.94	56.00	20.40	180.00	50.00	50.00	15.00
Nevada	29	23,322	258	12	23	13,053	----------	223,051.68	3	598	5,841.62	32.00	22.80	374.00	50.00	50.00	8.00
New Mexico	23	5,729	48,732	6	18	1,577	22,571	332,756.63	11	[2] 1,183	55,270.98	52.00	23.00	130.00	35.00	50.00	8.00
Utah	14	9,295	36	4	16	9,677	----------	358,742.19	13	6,759	39,019.88	24.00	20.50	53.00	53.00	50.00	----------
Colorado	35	4,881	203,452	3	20	500	39,006	330,434.31	12	[3] 20,231	56,214.79	12.00	9.80	16.70	15.00	----------	15.00
Montana	29	261,041	1,568	16	48	50,216	----------	1,459,949.35	35	23,102	81,408.20	18.00	15.80	62.20	50.00	50.00	----------
California	81	38,263	220	29	88	19,502	----------	721,788.91	34	11,448	156,757.95	31.00	18.40	62.00	40.00	50.00	20.00
Minnesota	16	----------	1,311,859	1	13	----------	204,905	2,317,119.65	12	[4] 47,653	1,185,560.03	30.00	5.40	48.50	8.00	----------	6.50
New Jersey	1	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------
United States	[5] 420	[6] 435,220	[7] 1,739,123	[8] 120	461	142,135	266,482	12,197,742.25	239	136,390	2,516,111.66	----------	----------	----------	----------	----------	----------

[1] This tonnage includes a portion from Georgia and North Carolina.
[2] Also 20,000 tons of 5 to 35 per cent.
[3] 5 to 35 per cent.
[4] 5 to 20 per cent.
[5] Includes 10 shippers from States named in footnotes 6 and 7.
[6] Includes 1,692 tons from New Jersey, North Carolina, Oregon, South Carolina, South Dakota, Texas, and Wyoming.
[7] Includes 76,586 tons from Michigan, North Carolina, South Carolina, Texas, and Wyoming.
[8] Includes 1 shipper from South Dakota.

The table makes evident the fact that, at any price heretofore reached, the production of domestic manganese has not been a remunerative business. As an aftermath of the World War, an opinion was put forth that, to strengthen national defense, mining industries developed during the war period should be fostered, so that in the event of another war an increased production could be easily attained from going concerns. Under the urge of this idea, in September, 1922, a duty (tariff of 1922) was placed upon imported manganese ores and ferromanganese. The duty stimulated mining; in 1923 the production supplied 4 per cent of our needs, in 1924 8 per cent, and in 1925 11 per cent. The price of manganese ore during 1923, 1924, and 1925 has remained relatively constant and has averaged 40 cents a unit on the basis of 50 per cent manganese tenor. Under the tariff a duty of 1 cent per pound was placed on all ores imported when the manganese content exceeded 30 per cent, making the duty on a 50 per cent ore $11.20, or a gross value of $31.20 for the ore. Under this price 11,060 tons of metallurgical ore were produced in 1923, 31,878 tons in 1924, and 76,173 tons in 1925. The production for the three-year period under the influence of the tariff, with a relatively maintained price, shows an increase over recent years, due to the maintained production of the Emma mine, whose product is mined primarily for its zinc content. The major producing areas in the three-year period are the Philipsburg and Butte districts, Mont.; Olympic Peninsula, Wash.; Batesville-Cushman district, Ark.; Leadville district, Colo.; Virginia; Cartersville district, Ga.; and New Mexico. The Philipsburg district produced 20,540 tons (chemical and metallurgical ore) in 1923, 23,526 tons in 1924, and 28,681 tons in 1925; the Butte district 1,376 tons in 1923, 11,919 tons in 1924, and 47,507 tons in 1925; the Olympic Peninsula produced nothing in 1923, 5,000 tons in 1924, and 8,113 tons in 1925; Batesville-Cushman district 3,768 tons in 1923, 3,400 tons in 1924, and 3,489 tons in 1925; Leadville district 2,278 tons in 1923, 5,338 tons in 1924, and 743 tons in 1925; Cartersville district 1,480 tons in 1923, 426 tons in 1924, and 1,385 tons in 1925. By August 1, 1925, all but one of the Leadville mines were closed, as they could not make a profit under existing prices and conditions. Production in the Batesville-Cushman district and of chemical ores in the Philipsburg district has remained relatively constant. The production of the Olympic Mountains has, however, shown a material increase. The property shipping this ore is well situated as to transportation and is now probably one of the lowest cost producers in the United States. The only inference to be drawn from the present trend of the industry is that even with the price maintained at three times the average before the World War and with the world price approaching the pre-war normal price, domestic production of metallurgical ore will probably decrease just as it did at the end of the war period.[21]

[21] International Control of Minerals: Min. and Met. Soc. Am., 1925, p. 62.

The following table shows the source of the domestic production and also the indicated total for reasonably possible manganese reserves of ferro grade as well as reserves of 5 to 35 per cent suitable for the manufacture of spiegel. In both classes of ore the reserves have been measured by a price index [22] figure of $50 a ton (the value in 1913 dollars). The assumption of this price has been based upon the performance of domestic mines during the World War.

The development of deposits in Virginia, Tennessee, Georgia, Alabama, and Arkansas has not progressed because there is now no known economic method for their beneficiation. Methods evolved for dressing other minerals have been utilized in an attempt to concentrate ores from the localities mentioned. All the mills erected during the World War period to treat residual manganese ores were failures. Concentration as now practiced in Arkansas has reverted to the most primitive methods.

The only new development during the period under discussion (1918 to 1925) is that of the Crescent mine in township 30 north, range 10 west, Clallam County, Wash. This mine is the only one yet developed in what seems to be a mineralized area of considerable magnitude. Little authentic information regarding the geology of the Olympic Peninsula is available. The only accurate description is that by Pardee.[23] Before 1918 the total production of manganese in Washington was less than 100 tons. In 1924 and 1925 the production was 13,113 tons.

A cursory examination of the Olympic area revealed the presence of what might be termed a wide manganese-bearing zone. In this zone occur the bodies of manganese minerals cited by Pardee, composed generally of silicate of manganese, with occasionally a small quantity of oxide. There are bodies which will contain more than 25 per cent of manganese and 17 to 38 per cent of silica. In the Crescent mine the principal mineral is hausmannite, with a small amount of bementite and carbonate. An analyzed hand sample showed 64 per cent of manganese. Impure limestone discolored by iron, and ranging in color from chocolate to dark red, usually is found surrounding or inclosing the lenses of high-grade ore. The mineralized zone mentioned may be traced through various townships in a semicircular line at about the same altitude as the Quinault Burn, township 22 north, range 9 west. The formation is exposed near Mount Angeles, Deer Park, the head of Copper Creek, near Lake Constant, and Copper Mountain. Owing to the roughness of the country, the thick vegetation, and the heavy seasonal rainfall, prospecting is difficult. There is a very large amount of mineral in the Olympic area that contains 15 per cent of manganese and is high in silica.

---

[22] International Control of Minerals: Min. and Met. Soc. Am., 1925, p. 64.

[23] Pardee, J. T., "Deposits of manganese ore in Montana, Utah, Oregon, and Washington"; chapter in Contributions to Economic Geology: U. S. Geol. Survey Bull. 725, 1922, pp. 230–242.

Manganese production through 1925 and reserves in the United States, in gross tons

[The production figures in this table do not agree with the figures which appear in the standard tables of domestic production in the Mineral Resources chapters on manganese. The figures in the tables in the chapters are the totals reported to the U. S. Geological Survey since its organization, and to earlier Federal agencies, and are probably minima for each State, whereas the totals in this table aim to be maxima where the records are obscure]

State	Total production through 1925 (including fluxing ore and manganiferous zinc residuum)		Indicated total reasonably possible reserves of manganese ore of ferro grade (35 per cent or more of manganese), at an index price of $50 a ton, by States							
				Crude		Concentrate		Total		Recoverable manganese	
	Ore containing 35 per cent or more of manganese	Ore containing 5 to 35 per cent of manganese	Total number of deposits examined	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
Alabama	3,615	2,668	12			2,800	7,800	2,800	7,800	1,300	3,500
Arizona	45,385	38,020	118	59,200	79,200	15,000	20,000	74,200	99,200	33,400	44,600
Arkansas:											
Batesville	95,637	92,322	203	160,000	210,000	112,000	152,000	272,000	362,000	126,500	168,300
Western	334		49	600	1,000			600	1,000	300	500
Total Arkansas	95,971	92,322	252	160,600	211,000	112,000	152,000	272,600	363,000	126,800	168,800
California	78,654	359	355	97,700	157,700			97,700	157,700	39,100	63,100
Colorado	28,799	3,088,078	92	141,600	241,600			141,600	241,600	49,600	84,600
Georgia	114,442	147,165	109			80,800	195,800	80,800	195,800	33,900	82,200
Michigan	137	(1)	5								
Minnesota		5,149,800	23								
Montana:											
Butte, carbonate	185,369		2	70,500	385,500			70,500	385,500	25,400	138,800
Butte, low-grade		22,253	38			73,200	123,200	73,200	123,200	30,700	51,700
Philipsburg	423,000	10,044	23	186,300	231,300	70,000	140,000	256,300	371,300	102,500	148,500
Other	428	1,579	21	400	400			400	400	150	150
Total Montana	608,797	33,876	84	257,200	617,200	143,200	263,200	400,400	880,400	158,750	339,150
Nevada	27,059	461,525	58	17,800	27,800			17,800	27,800	7,100	11,100
New Jersey	235	3,259,212	4								
New Mexico	11,422	237,283	61	11,000	17,500			11,000	17,500	4,400	7,000
Oregon	500		41	1,000	2,000	27,000	50,000	28,000	52,000	11,200	20,800
Tennessee	14,649	2,182	134	1,900	3,900	37,000	55,000	38,900	58,900	14,800	22,400

Utah	14,522	1,414	58	9,000	12,000			9,000	12,000	4,050	5,400
Virginia	380,431	43,795	255			293,500	993,500	293,500	993,500	123,300	417,300
Washington	13,288	393	16	16,900	41,900			16,900	41,900	8,500	21,000
Wisconsin	(1)	(1)	1								
Other States[2]	6,256	6,598	172	8,000	10,000			8,000	10,000	3,360	4,200
Grand total	1,444,162	12,564,690	1,850	781,900	1,421,800	711,300	1,737,300	1,493,200	3,159,100	619,560	1,295,150
Chemical ore	1,444,162	12,564,690	1,850	186,300	231,300			186,300	231,300	74,500	92,500
Metallurgical ore				595,600	1,190,500	711,300	1,737,300	1,306,900	2,927,800	545,060	1,202,650

[1] Figures of total production for Michigan and Wisconsin are not available. Available early figures cover the Lake Superior region.
[2] "Other States" under high-grade production are Massachusetts, Missouri, North Carolina, Oklahoma, Pennsylvania, South Carolina, South Dakota, Texas, Vermont, West Virginia, and Wyoming; under low-grade production are Mississippi, North Carolina, South Carolina, Texas, and Vermont; under reserves of ferro grade are Idaho, Maryland, New Jersey, North Carolina, Oklahoma, Texas, and Wyoming; and under reserves of spiegel and pig iron grade are Idaho, Mississippi, and Oklahoma.

Manganese production through 1925 and reserves in the United States, in gross tons—Continued

State	Indicated total reasonably possible reserves of ore of spiegel and pig grade (5 to 35 per cent of manganese), at an index price of $50 a ton for ferro grade ores, by States									
	Crude		Concentrate		Total		Recoverable manganese for spiegeleisen		Recoverable manganese for manganese-pig iron	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
Alabama										
Arizona										
Arkansas:										
Batesville, Western	32,200	56,200	130,000	170,000	162,200	226,200	32,400	45,200		
Total Arkansas	32,200	56,200	130,000	170,000	162,200	226,200	32,400	45,200		
California	50,000	75,000			50,000	75,000			2,500	3,750
Colorado	1,403,200	2,403,200			1,403,200	2,403,200	350,800	600,800		
Georgia			27,800	112,800	27,800	112,800	5,600	22,600		
Michigan	606,300	1,126,300			606,300	1,126,300	3,500	7,200	41,400	76,100
Minnesota	23,353,000	32,353,000			23,353,000	32,353,000	841,200	1,246,300	1,844,400	2,474,300
Montana:										
Butte, carbonate										
Butte, low-grade										
Philipsburg			40,000	65,000	40,000	65,000	12,000	19,500		
Other	1,600	3,600			1,600	3,600	300	600		
Total Montana	1,600	3,600	40,000	65,000	41,600	68,600	12,300	20,100		
Nevada	129,300	229,300			129,300	229,300	15,500	27,500		
New Jersey			4,518,500	5,518,500	4,518,500	5,518,500	542,200	662,200		
New Mexico	391,800	891,800			391,800	891,800	62,700	142,700		
Oregon										
Tennessee			5,000	10,000	5,000	10,000	1,250	2,500		

Utah										
Virginia			67,300	147,300	67,300	147,300	16,800	36,800		
Washington										
Wisconsin	[3] 500,000	[3] 1,000,000			[3] 500,000	[3] 1,000,000			25,000	50,000
Other States[2]	4,000	6,000	1,000	1,000	5,000	7,000	1,000	1,500		
Grand total	26,471,400	38,144,400	4,789,600	6,024,600	31,261,000	44,169,000	1,885,250	2,815,400	1,913,300	2,604,150
Chemical ore										
Metallurgical ore	26,471,400	38,144,400	4,789,600	6,024,600	31,261,000	44,169,000	1,885,250	2,815,400	1,913,300	2,604,150

[2] "Other States" under high-grade production are Massachusetts, Missouri, North Carolina, Oklahoma, Pennsylvania, South Carolina, South Dakota, Texas, Vermont, West Virginia, and Wyoming; under low-grade production are Mississippi, North Carolina, South Carolina, Texas, and Vermont; under reserves of ferro grade are Idaho, Maryland, New Jersey, North Carolina, Oklahoma, Texas, and Wyoming; and under reserves of spiegel and pig iron grade are Idaho, Mississippi, and Oklahoma.

[3] Reserves same as previously reported to be on hand. Since 1922 there have been shipped 935,000 gross tons of ore containing from 5.27 to 6.50 per cent of manganese. The estimated reserves for Wisconsin did not include material containing slightly in excess of 5 per cent manganese and consequently have not been revised by the shipment of 935,000 tons.

Manganese and manganiferous ore shipped from mines in the United States, 1910–1925, in gross tons

Year	Manganese and manganiferous ores, exclusive of fluxing ore			Fluxing ore containing manganese		
	Ore containing 35 per cent of manganese or more	Ore containing 10 to 35 per cent of manganese	Ore containing 5 to 10 per cent of manganese	Ore containing 35 per cent of manganese or more	Ore containing 10 to 35 per cent of manganese	Ore containing 5 to 10 per cent of manganese[1]
1910	2,258				41,260	19,841
1911	2,457	2,602	82		34,982	6,771
1912	1,664	2,782	117		38,081	10,537
1913	4,048	9,650			41,862	7,891
1914	2,635	60,484			31,182	6,599
1915	9,558	64,204	10,616	55	118,749	4,166
1916	31,474	316,600	81,615		137,253	8,858
1917	129,351	576,608	108,409	54	154,151	21,776
1918	305,869	818,003	236,103		98,160	18,196
1919	54,957	211,632	112,303	365	98,202	11,596
1920	94,420	357,279	279,687		123,970	6,728
1921	13,531	8,439	62,670		22,962	3,028
1922	13,404	344,674	251,614	2,278	27,705	1,666
1923	31,500	319,666	1,072,457	769	40,770	1,004
1924	56,515	286,470	587,026	1,833	24,972	
1925	98,324	267,252	1,153,268		25,384	2,150

[1] Includes ore containing less than 5 per cent of manganese, as follows: 1915, 796 tons; 1916, 1,026 tons; 1917, 141 tons; 1918, 1,634 tons; 1919, 844 tons; 1920, 1,250 tons; 1921, 998 tons; 1922, 117 tons.

FERRUGINOUS MANGANESE ORE

The domestic reserve of ferruginous manganese ore (10 to 35 per cent manganese) seems beyond doubt ample to supply the needs of the steel industry for many years. There are large deposits in Colorado, Georgia, Michigan, Minnesota, Montana, Nevada, New Mexico, and Virginia. Fully 70 per cent of the estimated reserves are on the Cuyuna range of Minnesota. The shipments of domestic ore carrying 10 to 35 per cent of manganese decreased from 286,470 tons, valued at $929,390, in 1924 to 267,252 tons, valued at $915,316, in 1925. This decrease is due to the slump in production in Colorado and Minnesota, whereas Michigan and New Mexico made decided increases.

Ferruginous manganese ore containing 10 to 35 per cent of manganese shipped from the Cuyuna district, Minn., 1917–1925, in gross tons

Mine	1917	1918	1919	1920	1921	1922	1923	1924	1925
Algoma (Hoch)	[1]84,125	21,200	24,478	[2]5,115					
Arko		733	500	2,044					
Cuyuna Mille Lacs (Louise)	112,554	132,515						12,337	15,896
Ferro	(1)	57,261	14,556						
Gloria			2,637	738					
Hillcrest							430		
Hopkins		36,651	5,819					6,190	19,929
Joan, Nos. 1 and 4	8,375	27,931		8,500					
Mahnomen	4,000	132,726	11,472	9,842		69,644	74,247	119,781	41,840
Mangan, Nos. 1 and 2	52,290	67,796	92	10,979					
Martin		349							
Merritt Nos. 1 and 2	33,180	78,555		33,239			[3]21,387		
Milford (Ida Mae)		5,134		[2]20,851					
Portsmouth						38,000			
Sagamore			79,248	163,904		197,449	154,570	21,607	
Sultana	65,018	64,158	120	[2]38,312					
	359,542	625,009	138,952	293,524		305,093	253,634	159,915	77,665

[1] Shipments from Ferro mine included with Algoma mine for 1917. Not reported separately.
[2] According to the Iron Trade Review.
[3] According to the Lake Superior Iron Ore Association.

MANGANIFEROUS IRON ORE

In 1925 domestic shipments of manganiferous iron ore containing 5 to 10 per cent of manganese were nearly double those of 1924. Shipments of this class of ore amounted to 1,153,268 tons, valued at $2,799,403, compared with 587,026 tons, valued at $1,713,943, in 1924. Shipments from Minnesota increased from 361,527 tons in 1924 to 741,409 tons in 1925 and those from Wisconsin from 175,316 tons to 404,014 tons. The consumption of manganiferous iron ore for use in the blast furnace in the manufacture of pig caused this increase. There has been no change in the method of valuation of these manganiferous iron ores, which are sold on the percentage of metallic content—manganese plus iron—based upon iron-ore value.

FERRO-ALLOYS

Virtually all the metallurgical manganese ore imported is manufactured into ferromanganese. A small amount is utilized in the manufacture of spiegeleisen, and during 1925 a limited tonnage was used in the manufacture of manganese pig.

PRODUCTION AND IMPORTS

H. W. Davis, in his report on Iron Ore, Pig Iron, and Steel, in Mineral Resources for 1925, says that in 1925 shipments of domestic ferromanganese increased 9 per cent and spiegeleisen 26 per cent. The average values per ton reported for ferromanganese and spiegeleisen at the furnaces in 1925 were, respectively, $101.78 and $25.10.

The production of ferromanganese in 1925 was 259,780 gross tons, averaging 78.93 per cent of manganese and containing 205,046 tons of that metal. In the production of ferromanganese in 1925 there were used 519,139 gross tons of foreign manganese ore, 34,942 tons of domestic manganese ore, 4,949 tons of iron ore, and 11,072 tons of cinder, scale, and scrap. The quantity of manganese ore used per ton of ferromanganese made in 1925 was 2.133 gross tons; in 1924, 2.186 tons; and in 1923, 2.243 tons. Of the foreign manganese ore consumed in 1925, 207,238 gross tons were from Brazil and averaged 43.52 per cent of manganese; Russia furnished 194,006 tons, averaging 48.17 per cent; India 68,326 tons, averaging 50.42 per cent; Africa 33,582 tons, averaging 46.97 per cent; and Chile, China, Cuba, and Porto Rico the remainder, averaging between 42.44 and 52.75 per cent. The average manganese content in the total foreign ore consumed in 1925 was 46.41 per cent. The improvement in the metallurgy of ferromanganese manufacture is evidenced in 1925 by the recovery of 80.44 per cent of the metallic manganese contained in all ore consumed, whereas during 1918 the manufacture of ferromanganese entailed a loss of 10 to 40 per cent of the manganese contained in the ore.

Ferromanganese and spiegeleisen shipped from furnaces in the United States, 1919-1925

Year	Ferromanganese		Spiegeleisen	
	Gross tons	Value	Gross tons	Value
1919	198,255	$27,093,816	90,855	$3,965,754
1920	[1]276,594	41,840,690	103,672	5,289,049
1921	[1]111,374	13,654,800	[2]69,230	2,838,692
1922	[1]161,612	10,673,638	70,253	2,162,836
1923	226,365	23,853,313	134,086	4,547,113
1924	[1]232,821	23,533,668	76,179	2,354,731
1925	[1]254,005	26,006,439	95,890	2,407,226

[1] Includes a small quantity of silicomanganese.
[2] Includes a small quantity of silicospiegel.

Ferromanganese and spiegeleisen imported for consumption in the United States, 1919–1925

Year	Ferromanganese		Spiegeleisen	
	Gross tons	Value	Gross tons	Value
1919	33,022	$4,283,541	27	$1,018
1920	59,254	7,775,278	5,234	277,900
1921	9,077	888,419	307	10,472
1922 (Jan. 1–Sept. 21)	72,136	6,125,469	3,899	268,135
1922 (Sept. 22–Dec. 31)	[1]22,871		4,252	
1923	[1]91,066	8,357,023	4,668	165,791
1924	[1]45,270	3,844,474	7,433	235,566
1925	[1]62,970	6,033,147	1,090	39,841

[1] Figures prior to Sept. 22, 1922, represent gross weight of the ferromanganese but since that date represent the manganese content only.

Manganese alloys imported into and made from domestic and imported ores in the United States, 1919–1925, in gross tons[1]

	1919		1920		1921		1922		1923		1924		1925	
	Alloy	Manganese	Alloy	Manganese	Alloy	Manganese	Alloy	Manganese	Alloy	Manganese	Alloy	Manganese	Alloy	Manganese
Ferromanganese:														
Imported	33,022	26,418	59,254	47,403	9,077	7,262	100,725	80,580	113,833	91,066	56,588	45,270	78,713	62,970
Domestic production[2]	185,893	120,163	294,603	209,496	104,129	79,319	150,010	117,836	251,938	196,844	211,965	165,776	259,780	205,046
From domestic ore[3]	62,188	36,234	42,815	27,900	10,838	7,419	2,547	2,017	13,070	10,008	7,352	5,600	14,910	11,592
From imported ore[3]	123,705	83,929	251,788	181,596	93,291	71,900	147,463	115,819	238,868	186,836	204,613	160,176	244,870	193,454
Total	218,915	146,581	353,857	256,899	113,206	86,581	250,735	198,416	365,771	287,910	268,553	211,046	338,493	268,016
Percentage of manganese as ferromanganese made from domestic ore		24.7		10.9		8.6		1.0		3.5		2.7		4.3
Number of plants making ferromanganese	19		20		12		6		12		11		8	
Spiegeleisen:														
Imported	27	5	5,234	1,047	307	61	8,151	1,630	4,668	934	7,433	1,487	1,090	218
Domestic production[2]	84,098	15,792	111,447	21,006	56,495	9,462	72,974	11,668	129,683	20,410	107,067	17,731	65,759	12,491
From domestic ore[3]	81,558	15,268	96,727	18,257	48,895	7,975	70,374	11,365	126,424	20,026	103,617	17,306	65,759	12,491
From imported ore[3]	2,540	524	14,720	2,749	7,600	1,487	2,600	303	3,259	384	3,450	425		
Total	84,125	15,797	116,681	22,053	56,802	9,523	81,125	13,298	134,351	21,344	114,500	19,218	66,849	12,709
Percentage of manganese as spiegeleisen made from domestic ore		96.7		82.8		83.7		85.5		93.8		90.1		98.3
Number of plants making spiegeleisen	11		10		6		4		7		6		2	
Total available supply of metallic manganese as alloys		162,378		278,952		96,104		211,714		309,254		230,264		280,725
Percentage of total manganese imported as alloys		16.3		17.4		7.6		38.9		29.8		20.3		22.5
Percentage of total manganese as ferromanganese made in the United States from imported ore		51.7		65.1		74.8		54.7		60.4		69.6		68.9
Percentage of total manganese as spiegeleisen made in the United States from imported ore		.3		1.0		1.6		.1		.1		.2		
Percentage of total manganese as ferromanganese made in the United States from domestic ore		22.3		10.0		7.7		.9		3.2		2.4		4.1
Percentage of total manganese as spiegeleisen made in the United States from domestic ore		9.4		6.5		8.3		5.4		6.5		7.5		4.5
Percentage of total manganese as alloys made from domestic ore		31.7		16.5		16.0		6.3		9.7		9.9		8.6
Percentage of total manganese made and imported as spiegeleisen		9.7		7.9		9.9		6.3		6.9		8.3		4.5
Total open-hearth and Bessemer steel	34,220,256		41,554,982		19,605,740		35,228,281		44,383,745		37,476,940		44,758,450	

[1] Table prepared by H. W. Davis. [2] Quantity made [3] Partly estimated.

PRICES

The price of ferromanganese has declined since 1918; during 1925 it averaged $119.79 per ton for material delivered at Pittsburgh, on an 80 per cent manganese basis, duty paid. The Harriman control of the Caucasian deposits probably will greatly influence the future price and domestic flow of ferromanganese. In December, 1925, the Harriman concessionaires turned over their holdings to the Georgian Manganese Co. (Ltd.), with a capital of $4,000,000. The shares of the company are divided among the following countries: United States, 51 per cent; Germany, 25 per cent (A. G. Gelsenkirschener and August Thyssen, 12.5 per cent each); and England, 15 per cent (Guinness, Duprex, and others). The remaining 9 per cent is divided among other countries and individual holders. With the exception of the World War period, the Bethlehem Steel Co. has not normally been a distributor of ferromanganese. The ferromanganese it manufactured was for its use. In order to assure utilization of the minimum royalty tonnage called for under the Harriman concessions, this company may be forced to become a distributor as well as a consumer of this alloy. Soon after the World War all of the independent producers of ferromanganese in this country, with the exception of E. J. Lavino & Co., of Philadelphia, shut down; England, and later Germany and India, supplied the majority of the requirements of independent steel companies. Since the manganese deposits of the Dagwin concessions of the Gold Coast, West Africa, were leased to the African Manganese Mining Co. (Ltd.) early in 1921, the larger part of the ore produced from the area has been shipped to Norway and there manufactured into ferromanganese. The Electro Metallurgical Sales Corporation controlled the operation in Norway and has been supplying part of the domestic imports of ferromanganese during 1925. The close of the year therefore indicates keen competition in the ferromanganese-manufacturing market, with every indication of a decided reduction in price.

Prices per gross ton of ferromanganese, spiegeleisen, and manganese ore in the United States, 1921–1925[1]

Month	Ferromanganese (80 per cent) (delivered at Pittsburgh)					Spiegeleisen (20 per cent) (at producers' furnaces)				
	1921	1922[2]	1923[2]	1924[2]	1925[2]	1921	1922	1923	1924	1925
January	$101.00	$61.90	$109.79	$113.79	$116.79	$46.25	$25.50	$34.90	$39.00	$32.00
February	96.85	65.32	112.29	112.29	119.79	37.75	28.00	35.75	39.00	33.00
March	89.00	67.82	120.79	112.29	119.79	34.20	28.00	37.25	38.00	33.00
April	87.50	69.07	124.79	112.29	119.79	32.00	30.00	39.25	36.00	33.00
May	83.00	72.32	129.79	112.29	119.79	31.75	36.00	43.00	36.75	33.00
June	76.50	72.82	129.79	112.29	119.79	29.60	35.25	46.00	36.00	32.00
July	75.00	72.29	122.29	110.79	119.79	27.50	35.00	45.00	35.00	31.50
August	70.75	72.29	122.29	98.79	119.79	26.20	37.00	45.00	32.50	32.25
September	64.75	80.59	114.79	97.79	119.79	25.25	38.00	43.50	32.00	33.00
October	61.65	105.47	112.79	104.79	119.79	24.85	37.75	40.00	31.00	33.00
November	60.00	104.92	113.79	107.29	119.79	25.00	36.80	39.00	31.75	34.00
December	60.00	104.92	113.79	109.79	119.79	25.00	35.50	38.00	31.00	34.00

[1] Iron Trade Review.
[2] Beginning with Sept. 22, 1922, a duty of 1⅛ cents a pound of contained manganese was placed on ferromanganese imports.

Prices per gross ton of ferromanganese, spiegeleisen, and manganese ore in the United States, 1921–1925—Continued

Month	Manganese ore (50 per cent)				
	1921	1922[3]	1923[3]	1924[3]	1925[3]
January	$18.75	$10.50	$29.45	$31.20	$32.20
February	17.50	11.00	29.45	32.70	32.70
March	17.25	12.50	31.70	32.20	33.20
April	14.00	12.75	33.20	32.20	33.20
May	14.00	12.75	32.70	32.20	32.70
June	12.50	13.25	32.95	31.70	32.20
July	12.50	13.50	32.95	30.70	32.20
August	12.50	13.75	32.95	30.20	32.20
September	12.50	14.35	31.70	30.20	31.70
October	12.50	25.50	31.70	30.20	31.70
November	12.50	25.50	31.70	31.70	31.70
December	12.00	25.50	31.70	32.20	31.70

[3] Beginning with Sept. 22, 1922, a duty of 1 cent a pound was placed on the metallic content of imported manganese ore. This amounts to $11.20 a ton on 50 per cent ore.

CONSUMPTION

The following table shows that approximately 42 per cent of the total tonnage of manganese ore imported and utilized in the manufacture of ferromanganese falls below the present standard requirements as to manganese content. By far the largest percentage of this class of ore was consumed by a company that operated the properties from which the ore was mined.

Foreign manganese ore used in manufacture of ferromanganese in the United States in 1925[1]

Country	Ore (gross tons)	Manganese contained	
		Per cent	Gross tons
Africa	33,582	46.97	15,775
Brazil	207,238	43.52	90,194
Chile	2,062	48.11	992
China	606	52.75	320
Cuba	10,543	43.12	4,546
India	68,326	50.42	34,447
Porto Rico	2,776	42.44	1,178
Russia	194,006	48.17	93,455
	519,139	46.41	240,907

[1] Table compiled by H. W. Davis.

In 1925 the production of ferromanganese from domestic and foreign ores, as compared with previous years, shows relatively little change in the utilization of this alloy in reference to the total output of steel.

The firms that made or shipped ferromanganese and spiegeleisen in 1925 are listed below (f indicates ferromanganese; s, spiegeleisen):

(f) Anaconda Copper Mining Co., Great Falls, Mont.
(f) Bethlehem Steel Co., Sparrows Point, Md.
(fs) Bethlehem Steel Co., Johnstown, Pa.
(f) Electro Metallurgical Co., Niagara Falls, N. Y.
(s) Jackson Iron & Steel Co., Jackson, Ohio.

(f) Lavino Furnace Co., Lebanon and Marietta, Pa., and Reusens, Va.
(fs) Lavino Furnace Co., Sheridan, Pa.
(s) New Jersey Zinc Co., Palmerton, Pa.
(f) Tennessee Coal, Iron & Railroad Co., Bessemer, Ala.
(f) United States Steel Corporation, Etna, Neville Island, and Pittsburgh, Pa.
(s) United States Steel Corporation, Etna and Pittsburgh, Pa.

From 1918 to 1923 the ratio of the consumption of spiegeleisen to the tonnage of steel produced was relatively the same as that prior to the World War. In 1924 and 1925 the consumption seems to indicate a decidedly smaller use for this alloy, which may in part account for the increased consumption of manganiferous ores in the manufacture of pig. This use began during the war period when, owing to the shortage of manganese and to the low grade of domestic manganese deposits, a manganiferous pig iron was used and mixed with steel with a smaller quantity of ferromanganese in order to lessen shipments of ore by sea. In 1924, 114,500 tons of spiegel were produced and imported. Shipments from furnaces plus imports in the same year were 83,612 tons. In 1925 production plus imports amounted to 66,849 tons and shipments plus imports to 96,980 tons, showing that production plus imports fell off 47,651 tons and shipments plus imports or approximate consumption increased 13,368 tons. In 1925 the increase in shipments over those of 1924 was made possible by stocks accumulated in previous years. The domestic manufacture of spiegel in 1925 was 65,759 tons, containing 12,491 tons of metallic manganese. The shipments were 95,890 tons, containing 18,248 tons of metallic manganese.

MANGANIFEROUS RESIDUUM

Manganiferous residuum, from zinc roasting in the United States, shipped in 1918–1925, in gross tons

1918	146, 796	1922	81, 333
1919	80, 418	1923	132, 801
1920	133, 602	1924	119, 457
1921	12, 627	1925	147, 937

MANGANIFEROUS SILVER ORE

Manganiferous silver ore shipped from mines in the United States, 1917–1925, in gross tons [1]

Year	Arizona	Colorado		Montana	Nevada	New Mexico	Utah
		For fluxing	For other purposes				
1917	32, 409	20, 600	104, 115	----------	122, 872	----------	100
1918	10, 854	24, 931	99, 110	----------	80, 096	475	----------
1919	1, 964	29, 769	11, 055	----------	77, 815	250	----------
1920	345	34, 670	11, 056	----------	95, 142	541	----------
1921	----------	10, 819	924	----------	14, 871	300	----------
1922	----------	13, 951	----------	6, 656	----------	8, 764	----------
1923	----------	10, 376	18, 348	3, 596	28, 571	----------	----------
1924	----------	4, 488	30, 949	5, 607	16, 710	----------	----------
1925	----------	11, 366	7, 352	----------	16, 168	----------	----------

[1] All used for fluxing except that from Colorado designated "For other purposes."

Manganiferous ores have been used largely as a substitute for iron ores as flux in smelting precious and semiprecious metals. As a rule, the deposits of this class of ore found in the Rocky Mountain region carry enough silver to add materially to their value.

MANGANIFEROUS ORES UTILIZED IN MANUFACTURE OF MANGANESE PIG

In 1925 the domestic shipments of manganiferous ores containing 5 to 10 per cent of manganese were nearly double those of 1924. The consumption of manganiferous and ferruginous ores in blast-furnace practice is responsible for this increase. The shipments of this class of ore amounted to 1,153,268 tons in 1925, valued at $2,799,403, compared with 587,026 tons in 1924, valued at $1,713,943.

CUYUNA RANGE SHIPMENTS

Manganiferous iron ore (containing 5 to 10 per cent of manganese) shipped from the Cuyuna district, Minn., 1917–1925, in gross tons

Mine	1917	1918	1919	1920	1921	1922	1923	1924	1925
Cuyuna Mille Lacs (Louise)		25,560						9,737	165,142
Hillcrest	9,590	20,242			15,473	4,100			
Kennedy				9,511					
Mahnomen	82,000	175,648	90,896	81,066	41,057	110,560	282,883	128,967	206,155
Mangan, Nos. 1 and 2		4,679							
Martin		1,073							
Milford (Ida Mae)						870	77,300		205,050
Portsmouth				158,336		133,000	138,998		
Sagamore			7,324					222,823	165,062
	91,590	227,202	98,220	248,913	56,530	248,560	499,181	361,527	741,409

IMPORTS

Manganese ore imported into the United States, 1922–1925

[General imports]

Country	1922				1923		1924		1925	
	Jan. 1–Sept. 21		Sept. 22–Dec. 31							
	Ore (gross tons)	Value	Manganese content (gross tons)	Value	Manganese content (gross tons)	Value	Manganese content (gross tons)	Value	Manganese content (gross tons)	Value
Africa (British):										
South	5,998	$21,891								
West	22,701	106,223			27,965	$297,376	23,034	$266,216	31,750	$322,360
Argentina					928	20,040				
Belgium			528	$18,050						
Brazil	234,598	2,025,505	40,595	469,938	88,036	1,454,790	54,938	1,392,536	109,650	2,755,876
Canada	60	2,208	67	3,619			60	3,222	1,199	49,406
Chile					789	16,772	1,178	37,858	3,434	64,608
China	2	46	1	67	1	55			245	12,000
Cuba	12,568	89,677			(1)	137,016	(1)	347,874	(1)	253,315
Germany	41	3,259	52	5,131	146	14,654	48	5,659	46	6,195
Hongkong			1,243	28,677	20	1,020	278	8,838	622	22,528
India (British)	24,250	82,016	298	4,793	25,568	625,299	54,566	1,340,119	23,504	550,871
Java and Madura			205	10,250	6	369				
Mexico	500	10,000								
Netherlands					26	1,664	3,632	153,709	5	637
Oceania (French)					(2)	36				
Panama	(2)	19			400	5,300				
Russia in Europe			1,642	38,180	11,670	262,790	41,097	1,050,832	114,537	4,101,070
Turkey:										
In Europe	26,561	336,638	1,000	50,000	38,139	914,156	52,557	1,429,788		
In Asia					3,005	86,798				
United Kingdom[3]	448	18,242	1,093	74,429	287	36,375	5	209	1,572	119,788
	327,727	2,695,724	46,724	704,040	[4]196,986	3,874,510	[4]231,393	6,036,860	[4]286,564	8,258,654

[1] The imports from Cuba are recorded as 9,062 gross tons of ore in 1923; 23,065 tons in 1924; and 12,745 tons in 1925; manganese content not shown. Producers of manganese ore in Cuba report that approximately 23,000 gross tons of ore were exported to the United States in 1925, of which 4,500 tons were shipped late in December.

[2] Less than 1 ton.

[3] Recorded as England prior to 1925.

[4] Exclusive of the manganese content of Cuban ores.

CHEMICAL ORES

PRODUCTION

Prior to 1918 the United States depended almost entirely on foreign sources for its chemical ores. As has been noted, during the war the chemical ores of Philipsburg, Mont., were exploited, and since 1918 they have supplied a material percentage of the domestic need.

The shipments in 1923 were 20,440 tons, in 1924 24,637 tons, and in 1925 22,151 tons. The average price of chemical ore for 1925 was $75 for 82 to 87 per cent of MnO_2, according to the Engineering and Mining Journal-Press.

Chemical manganese ore shipped from mines in the United States, 1919–1925, by States

Year	California		Montana		Virginia		Total	
	Gross tons	Value	Gross tons	Value	Gross tons	Value	Gross tons	Value
1919	179	(1)	19,896	(1)			20,075	$797,163
1920			14,809	(1)	18	(1)	14,827	539,543
1921			11,129	$444,981	102	$3,000	11,231	447,981
1922			9,706	(1)	800	(1)	10,506	404,965
1923			19,540	646,225	900	40,000	20,440	686,225
1924			23,512	816,463	1,125	50,000	24,637	866,463
1925			20,529	825,970	1,622	77,000	22,151	902,970

[1] Bureau of Mines is not at liberty to publish figures.

USES

In all the present uses for chemical ore, except in the manufacture of such chemicals as permanganates, only the oxygen contained in these ores as MnO_2 has value. The sole mineral of manganese that can be economically utilized for this purpose is pyrolusite. Pure pyrolusite contains 63.2 per cent of manganese and 36.8 per cent of oxygen. By treating the dioxide of manganese with acids one atom of oxygen is liberated from each molecule. This liberated atom constitutes what is known in the utilization of dioxide ores as the "available oxygen." In a pure pyrolusite, therefore, there is only 18.39 per cent of available oxygen. No commercial bodies of the mineral pyrolusite are known. This mineral is invariably associated with other minerals that greatly reduce the quantity of available oxygen.

RESERVES AND CONSUMPTION

The major reserves and production of the world are those of Georgia (in the Caucasus), India, and the Gold Coast. Cuba, Chile, and China are of minor importance. The major reserves of the United States are found in the Philipsburg district of Montana; those of Virginia are of minor importance.

The domestic consumption has been estimated at 47,000 tons in 1925. Of this the dry-battery trade absorbed approximately 40,000 tons. No dependable figures are available to show the amount of chemical ores used in the glass, brick, and chemical trades, but it is estimated to be about 7,000 tons.

MANGANESE MINING, BY STATES

Alabama.—The 1925 shipments of manganese ore (35 per cent plus manganese) were 938 tons, showing a decrease of 304 tons from the peak of production in 1924. Shipments for 1925 of ferruginous manganese ore containing 10 to 35 per cent were 298 tons, as compared with 611 tons in 1924. There was no production of manganiferous ore. One shipper who contributed materially to the 1924 production did not ship in 1925. The production from 1918 to 1925 would indicate that the price received by the producers of manganese had not justified mining the grades of ore available.

Arizona.—In 1925 Arizona shipped 294 tons of manganese ore but produced no ferruginous manganese or manganiferous ore. This State reached its maximum production in 1918, with 17,612 tons of high-grade ore. Large tonnages of highly siliceous manganese ore occur in the State, but there is no metallurgical method known at present by which the manganese in this material can be made commercially available.

Arkansas.—In 1925 Arkansas shipped 3,517 tons of ore containing 48 per cent plus of manganese. The 1924 production of similar ore was 3,400 tons. Shipments of ferruginous manganese ore for 1925 were 5,076 tons, as compared with 7,991 tons in 1924. No ore below this grade was produced. Arkansas attained its maximum production in 1917, with 10,140 tons. Virtually all of the output of this State is shipped to the Tennessee Coal, Iron & Railroad Co., which uses the ferruginous manganese ore in the manufacture of pig iron containing manganese.

In the Club House mine of the Cushman district rhodochrosite, altering to psilomelane and hausmannite, was discovered in place in the spring of 1925. This discovery seems to cast doubt upon the soundness of the theory heretofore accepted as to the origin of the manganese deposits of this district.

In part, the accepted theory has been that the manganese was derived from the decay of Archean and other pre-Paleozoic rocks in the near-by regions, was dissolved and transported in the form of soluble organic and inorganic salts such as carbonates, and was precipitated as oxides or carbonates in the various rocks found in the Batesville-Cushman district, such as the Cason shale. According to the theory, decomposition of the rocks gave deposits of the residual type in such beds as the Fernvale limestone. The discovery in the Club House mine makes it seem possible that part of the manganese ore was deposited as rhodochrosite from deep-seated sources, as this mineral is usually regarded as of deep-seated origin.

California.—In 1925 shipments of manganese ore carrying 45 per cent or more of manganese amounted to 869 tons. In 1924 production of ore of this class was 850 tons. California attained its maximum production in 1918, with 24,067 tons. No lower-grade ore was produced in 1924 or 1925. California mines that have attained depth have bottomed the oxidized ores and have encountered mixtures of rhodonite and rhodochrosite. Large tonnages of these mixtures are known to exist.

Colorado.—In 1925, 743 tons of ore containing 38 per cent or more of manganese were shipped. In 1924 the production of this character of ore was 5,338 tons. The mining of manganese ore for steel-manufacturing purposes began in 1915 with a production of 150 tons. The

maximum production so far was attained in 1919, when 11,166 tons of high-grade ore were produced. Shipments of ferruginous manganese ore in 1925 were 7,352 tons, compared with 27,058 tons in 1924. No manganiferous iron ore was produced in Colorado in 1925. By August 1, 1925, all but one of the Leadville mines were closed, due to the inability of the miners to make better than wages in this class of mining. There are large tonnages of siliceous manganese ore in the Leadville district.

Georgia.—In 1925 shipments of high-grade ore containing 35 per cent plus of manganese amounted to 1,649 tons. In 1924 the production of this class of ore was 1,093 tons. Georgia attained its maximum production of manganese ore in 1887, with 9,024 tons. In 1925 shipments of ferruginous manganese ore containing 10 to 35 per cent of manganese totaled 28,038 tons and in 1924, 14,182 tons. In 1925, 7,349 tons of manganiferous ore were shipped; in 1924, 6,353 tons. In 1924 and 1925 manganese ore was produced in Georgia by the largest number of shippers in any State.

Michigan.—This State does not produce manganese ore, but in 1925 the production of ferruginous manganese ore carrying an average of 10.89 per cent of manganese was 98,753 tons in contrast to 50,556 tons for the preceding year. In 1924 the production of manganiferous ore amounted to 39,939 tons, but there was no production of this grade of ore in 1925.

Minnesota.—Minnesota produces but two grades—ferruginous manganese ore and manganiferous ore. A small production of manganese ore could possibly be made by hand sorting. In 1925 shipments of ferruginous manganese ore containing 11 per cent of manganese were 77,665 tons. In 1924 the shipments were 159,915 tons containing 11.3 per cent of manganese. The shipments of manganiferous ore in 1925 were 741,409 tons, with an average manganese content of 7.8 per cent. In 1924 the shipments of this class of ore were 361,527 tons. The number of men engaged in mining manganese ore in 1925 was 514, the man-days worked were 146,816, and the production per man-day was 5.58 tons. Minnesota attained its maximum production of ore containing 5 to 10 per cent of manganese in 1925, with every indication of a very greatly increased production of manganiferous ore in 1926.

This ore is shipped from the Cuyuna range. In 1911 prospecting on this range was very active, and large bodies of manganiferous ore were found in township 47 north, range 29 west. There was no market for this material at that time, but the World War created a demand for it. All stocks on hand were shipped in 1925, and new properties are being stripped to meet the anticipated demand in 1926. More than 70 per cent of the reserves of manganiferous ore attributed to the United States are in the Cuyuna range. Rendering the manganese contained in the ferruginous manganese and manganiferous iron ores of this locality available for use in the manufacture of ferromanganese is an outstanding metallurgical problem in this country.

Montana.—There are two producing areas of commercial importance in Montana; the Butte area yields metallurgical ore and the Philipsburg area ships 97 per cent of the chemical ore produced in this country. In 1925 shipments from the Butte district of metallurgical ore containing 37.9 per cent of manganese amounted to

47,507 tons. This ore was rhodochrosite and was mostly used in the manufacture of ferromanganese. In 1924 the Butte district produced 11,919 tons of ore of this character. In the Philipsburg district the shipments of chemical ore in 1925 were 20,529 tons. Montana shipped no manganese ore of lower grade. The number of men engaged in the mining of chemical ore in 1925 was 56, the man-days worked were 16,416, and the production per man-day was 1.25 tons. The peak of production in Montana was attained in 1918, when 199,932 tons were shipped. Large bodies of mixtures of rhodochrosite and rhodonite containing 15 per cent and more of manganese are known.

Nevada.—In 1925 Nevada shipped 850 tons of high-grade ore containing 38 per cent of manganese. In 1924 the shipments of ore of this character were 1,310 tons. Nevada attained its maximum production in 1918, with 19,872 tons. The shipments of ferruginous manganese ore in 1925 were 6,659 tons, containing 10 to 35 per cent of manganese. In 1924 the shipments of ore of this character amounted to 2,591 tons. There was no production of manganiferous iron ore in either 1924 or 1925. The high production of 1918 was due to the shipments from the Three Kids mine, near Las Vegas, which was exhausted of ore suitable at current price in 1924. During 1925 shipments from Pioche of manganiferous silver ore for fluxing purposes amounted to 16,168 tons. Considerable development work has been done on the Virginia Louise mining claims of that camp.

New Mexico.—In 1925 the shipments of manganese ore containing 46 per cent of manganese were 1,588 tons. The shipments in 1924 were 775 tons, with an average manganese content of 43 per cent. The shipments of ferruginous manganese ore in 1925 were 40,848 tons, containing 13 per cent manganese. In 1924 the shipments of this class of ore were 23,246 tons containing 15 per cent of manganese. No manganiferous ore was produced in 1924 or 1925. The number of men engaged in the mining of manganese in 1925 was 115, the man-days worked were 35,365, and the production per man-day was 1.20 tons. The maximum shipments of manganese ore from mines in New Mexico were in 1918, when they amounted to 3,126 tons.

Tennessee.—In 1925 the shipments of manganese ore containing 50 per cent plus of manganese amounted to 352 tons; in 1924 the shipments amounted to 455 tons, with a manganese content of 49.5 per cent. The largest shipments of manganese ore from the Tennessee mines were in 1918, amounting to 4,162 tons. The number of men engaged in the mining of manganese in 1925 was 8, the man-days worked were 2,000, and the production per man-day was 0.18 ton.

Utah.—Fifty tons of manganese ore containing 37.95 per cent of manganese were shipped in 1925. No ore of this grade was produced in 1924. In 1925 there were 666 tons of ferruginous manganese ore shipped, which contained 23.7 per cent of manganese. In 1924 the shipments of ore of this character amounted to 116 tons, containing 17.7 per cent of manganese. In 1918, 5,100 tons of manganese ore were shipped—the maximum production so far attained in Utah. The number of men engaged in the mining of manganese in 1925 was 19, the man-days worked were 2,978, and the production per man-day was 0.407 ton.

Virginia.—Shipments of manganese ore containing 46.4 per cent of manganese amounted to 3,121 tons in 1925. Of these shipments 1,499 tons were metallurgical ore and 1,622 tons chemical ore. The 1924 shipments of manganese ore were 1,565 tons, containing 46.6 per cent of manganese. The shipments of ferruginous manganese ore in 1925 were 1,800 tons, containing 10 to 35 per cent of manganese, compared with 204 tons shipped in 1924. No shipments of manganiferous iron ore were made in either year. The number of men engaged in the mining of high-grade manganese ore in 1925 was 51, the man-days worked were 8,816, and the production per man-day was 0.354 ton. Virginia made its maximum production of high-grade ore—20,567 tons—in 1886. Of this, 19,382 tons came from the Crimora mine, then operated by underground selective methods of mining by the Carnegie Steel Co. The Virginia deposits are of the residual type. Past inaccuracy as to the ratio of recoverable ore to material handled has been the main cause of the many failures. No commercial process has been adapted to the beneficiation of the Virginia manganese deposits.

Washington.—The 1925 shipments of manganese ore containing 51.64 per cent of manganese amounted to 8,113 tons, the highest production attained so far. The 1924 shipments were 5,000 tons, containing 52.88 per cent of manganese. All of this tonnage came from the Crescent mine, on the Olympic Peninsula. There were no shipments of the lower-grade ores in either year. Prospecting was very active during the year, and considerable work was done in the Quinalt Burn. Prospecting is very difficult because of the amount of surface soil and the topography. The number of men engaged in the mining of manganese in 1925 was 30, the man-days worked were 10,200, and the production per man-day was 0.795 ton.

Wisconsin.—In 1925 the only class of manganese ore shipped in Wisconsin was manganiferous ore, which amounted to 404,014 tons and contained 5.27 per cent of manganese. The 1924 shipments of such ore totaled 175,316 tons, averaging 5.72 per cent of manganese.

LEAD[1]

By J. A. Stader and A. Stoll[2]

SUMMARY

Statistics of refined lead in the United States, 1924–25, in short tons

	1924	1925
PRODUCTION		
Domestic desilverized lead	299,343	345,429
Domestic soft lead	203,615	260,560
Domestic desilverized soft lead	63,449	48,932
	566,407	654,921
Foreign desilverized lead	124,086	112,048
Total refined primary lead [1]	690,493	766,969
Antimonial lead	20,787	19,667
Secondary lead [1]	204,500	226,880
CONSUMPTION [2]		
Apparent consumption of primary lead, refinery stocks disregarded	602,947	655,655

[1] "Primary lead," which is produced directly from ore, is here distinguished from "secondary lead," which is obtained by refining skimmings, drosses, and old metals. The statistics of secondary lead are given on p. 199. In this report the word "lead" used without qualification means primary lead.
[2] For method of calculating consumption, see p. 208 and 209.

The output of refined lead in the United States from domestic ores in 1925 was 654,921 short tons, valued at $113,956,000, at the average selling price of pig lead based on total sales by producers, a gain, as compared with 1924, of 16 per cent in quantity and of 26 per cent in value.

PRODUCTION

QUANTITY AND VALUE

The total refined lead produced in the United States from 1720 to 1925 from domestic ores and from foreign ores and base bullion and its value are shown in the following table:

[1] Chapters on lead giving more than ordinary detail were published in Mineral Resources for 1908 (historical table of production) and 1918 (the lead industry in relation to the World War).
[2] Figures on imports and exports compiled by J. A Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

Refined lead produced in the United States, 1720–1925

Year	Short tons							Value	
	Desilverized lead [1,2]	Desilverized soft lead	Soft lead [2]	Total production [1]	From domestic ores and base bullion	From foreign ores	From foreign base bullion	Average per pound	Total
1720–1912	7,176,497	326,991	2,929,180	10,432,668	8,545,383	1,887,285			$924,600,000
1913	301,160	29,433	131,867	462,460	411,878	13,223	37,359	$0.044	40,696,000
1914	340,397	43,506	158,219	542,122	512,794	7,639	21,689	.039	42,286,000
1915	344,593	44,001	161,461	550,055	507,026	9,581	33,448	.047	51,705,000
1916	335,375	68,244	167,515	571,134	552,228	6,085	12,821	.069	78,817,000
1917	365,998	56,268	188,503	610,769	548,450	15,872	46,447	.086	105,052,000
1918	382,314	47,418	210,463	640,195	539,905	15,334	84,956	.071	90,908,000
1919	266,538	67,938	147,744	482,220	424,433	7,656	50,131	.053	51,115,000
1920	273,135	66,668	189,854	529,657	476,849	8,414	44,394	.080	84,745,000
1921	238,329	52,747	157,513	448,589	398,222	7,120	43,247	.045	40,373,000
1922	249,107	74,305	209,250	532,662	468,746	13,898	50,018	.055	58,593,000
1923	366,241	61,332	190,749	618,322	543,841	24,288	50,193	.070	86,565,000
1924	423,429	63,449	203,615	690,493	566,407	46,385	77,701	.080	110,479,000
1925	457,477	48,932	260,560	766,969	654,921	47,024	65,024	.087	133,453,000
	11,520,590	1,051,232	5,306,493	17,878,315	15,151,083	2,727,232			1,899,387,000

[1] The lead content of antimonial lead is excluded; see p. 198.
[2] Desilverized soft lead is excluded.

Details for years prior to 1913 are shown in the annual chapters. The value for years prior to 1917 is based upon the average price in New York; beginning with 1917 the value is based on the total sales of each producing company.

PRODUCTION BY STATES

To apportion the production of refined lead according to sources of ore is difficult; lead refiners treat products already smelted, whose origin may, as in custom refining, be unknown to them, because the identity of the ore is preserved only as far as the smelter. Accordingly, the following table is compiled, so far as possible, from smelter figures. It includes "pig lead" reported by all smelters running on Mississippi Valley or other "soft" lead ores and "work lead" produced at all other lead smelters, except that the greater part of the product reported by silver-lead smelters operated in conjunction with refineries is stated in terms of refined lead. A like part of the antimonial lead is thus eliminated from the "work lead" produced and appears only in the figures of production of antimonial lead.

In addition to the domestic lead ores smelted in this country, small quantities of domestic lead ore have been exported to smelters in Canada. In 1912 soft lead amounting to 63 tons was smelted from Wisconsin ores at Canadian smelters, and in 1913 soft lead amounting to 37 tons from Wisconsin ores and desilverized lead amounting to 98 tons from Idaho and Washington ores were smelted at Canadian smelters. The desilverized lead smelted in Canada from Washington ores amounted to 31 tons in 1914, to 137 tons in 1915, and to 2,001 tons in 1916. In 1917 silver-lead ores from Idaho and Montana smelted in Canada produced 4,570 tons of lead. Ores from Washington yielded 1,388 tons of lead at Canadian smelters in 1918 and 3 tons in 1919, but no lead ore from the United States was treated in Canada from 1920 to 1925.

Primary lead smelted or refined in the United States, 1916–1925, by sources, in short tons

Source of ore	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925
Domestic ore:										
Alaska	659	884	531	645	591	773	324	400	582	699
Arizona	15,328	7,456	6,195	5,407	5,987	3,313	7,218	8,828	9,372	10,281
Arkansas [1]	170	300	14							
California	3,633	11,471	6,228	2,004	2,260	614	3,018	5,168	2,305	4,148
Colorado	33,046	29,327	29,395	18,867	17,752	12,104	11,108	23,885	25,491	31,855
Idaho	170,059	174,045	142,640	89,091	117,191	99,707	91,487	127,797	123,709	123,363
Illinois [1]	670	867	1,010	977	948	271	750	1,286	1,089	474
Kansas [1]	1,737	2,663	5,023	7,951	8,421	10,939	10,900	20,207	12,895	15,001
Kentucky [1]	37	21	109	83	114	41	73	66	201	96
Missouri [1]	218,253	218,197	187,743	150,341	171,999	151,028	202,245	169,323	191,501	208,547
Montana	4,961	5,933	17,586	17,513	13,231	11,565	14,551	18,345	21,226	22,008
Nevada	11,858	12,334	8,726	5,958	8,650	3,553	4,264	8,044	8,070	10,978
New Hampshire	46			16						
New Mexico	3,290	3,428	5,140	1,418	1,123	384	1,230	1,638	2,263	3,782
New York			49							
Oklahoma [1]	10,969	19,646	58,755	49,984	68,494	46,902	67,436	59,602	56,017	78,487
Oregon	9		6				37	47		6
South Dakota	12	34	28	18	6	2	2		2	2
Tennessee [1]			843	2,371	2,705		751	1,020	985	436
Texas	26	58	30	8	1	1	5	40	27	31
Utah	111,789	82,081	76,169	65,102	64,006	51,872	63,130	104,678	119,318	166,844
Virginia [1]	740	147	59						1,582	2,179
Washington	217	929	906	1,090	2,460	325	478	2,008	2,057	2,802
Wisconsin [1]	3,121	2,930	4,275	3,975	3,841	1,079	1,323	601	1,973	2,889
Undistributed	113	145	59	119	201	101	75	691	15	2
Zinc residues	5,478	6,489	5,359	4,887	4,366	713	1,284	362	1,320	1,541
	596,221	579,385	556,878	427,825	494,347	395,287	481,689	554,036	582,000	686,451
Foreign ore:										
Africa	328	1,738	1,519	644	1,171			99	6	
Australia			282	69	450					
Canada	1,231	1,100	7,550	1,895	1,186	2,877	3,604	3,632	4,633	10,676
Central America	7			12	22	6	14	18	30	6
Europe	236	3,552	84	122	19	17	519	139	328	470
Mexico	1,917	7,607	4,798	2,261	2,729	1,912	7,260	18,867	33,328	31,107
South America	2,366	1,533	1,101	2,537	2,747	2,235	2,458	1,461	7,663	4,496
Other foreign		342		116	90	73	43	72	397	269
Foreign base bullion:										
Canada	1,072	6,750	8,108	567	1,919	1,599	2,900			
Mexico	11,598	39,508	76,809	49,564	42,421	41,648	47,118	50,193	77,701	65,024
South America	151	189	39		54					
	18,906	62,319	100,290	57,787	52,808	50,367	63,916	74,481	124,086	112,048
Grand total	615,127	641,704	657,168	485,612	547,155	445,654	545,605	628,517	706,086	798,499

[1] The lead produced by these States is nonargentiferous or soft lead. A small quantity of the lead produced from Colorado and New Mexico ores is also nonargentiferous.

SOFT LEAD

The lead ores of the Mississippi Valley are almost free from silver, and the lead produced from them is known as soft lead. The output of the lead pigment, known as basic lead sulphate or sublimed lead, is derived from these ores.

The lead ores from the southeastern Missouri district contain a little more silver (slightly over an ounce to the ton of concentrates in all) than those from other regions of the Mississippi Valley, and likewise small quantities of other metals, so that the unrefined lead, though soft, is resistant to acids and is much in favor for sulphuric acid chambers. It is known to the trade as "chemical lead."

The zinc ores from Western States that are made into pigments may contain some lead which goes into the pigment, and therefore it is not strictly accurate to speak of the lead content of pigments as entirely soft lead.

In addition to the domestic lead so recovered, some foreign lead is also recovered in pigments. Prior to 1919 this foreign lead was not distinguished from that of domestic origin. In 1919 the quantity of foreign lead recovered in zinc pigments was 351 short tons; in 1920, 808 tons; in 1921, 169 tons; and in 1924, 545 tons. No foreign lead was used in pigments in 1922, 1923, or 1925.

Soft lead produced in the United States from domestic ores, 1921–1925, in short tons

Year	Soft pig lead			Soft lead recovered in pigments	Total soft lead	Total domestic lead [1]	Soft lead percentage of domestic lead
	Undesilverized	Desilverized	Total				
1921	157,513	52,747	210,260	9,989	220,249	414,886	53
1922	209,250	74,305	283,555	13,892	297,447	488,448	61
1923	190,749	61,332	252,081	13,612	265,693	567,247	47
1924	203,615	63,449	267,064	15,338	282,402	593,486	48
1925	260,560	48,932	309,492	17,547	327,039	684,968	48

[1] Includes domestic refined lead, domestic lead in antimonial lead, and domestic lead in pigments.

ANTIMONIAL LEAD

The production of by-product antimonial lead from argentiferous lead ores derived from all sources, as reported by all lead refineries operating in this country, is shown for the period 1871–1914 in Mineral Resources, 1914, and for 1915 in Mineral Resources, 1920. The figures for later years are given in the table below.

By-product antimonial lead produced in the United States, 1916–1925

Year	Total lead refined from base bullion (short tons)	By-product antimonial lead (percentage of total)	Antimonial lead					
			From domestic ore (short tons)	From foreign ore (short tons)	Total			
					Short tons	Value	Antimony content	Lead content, by difference (short tons)
							Short tons	Percentage	
1916	335,375	7.2	17,246	6,792	24,038	$4,483,582	3,496	14.5	20,542
1917	365,998	5.1	15,279	3,367	18,646	3,781,560	2,759	14.8	15,887
1918	382,314	4.9	10,777	7,793	18,570	2,826,350	2,566	13.8	16,004
1919	266,538	5.2	9,674	4,200	13,874	1,513,968	1,943	14.0	11,931
1920	273,135	4.6	9,604	2,931	12,535	1,963,255	2,033	16.2	10,502
1921	238,329	4.2	7,881	2,183	10,064	870,059	1,589	15.8	8,475
1922	249,107	3.2	7,068	1,007	8,075	844,993	1,441	17.8	6,634
1923	366,241	3.9	11,635	2,555	14,190	1,950,370	2,170	15.3	12,020
1924	423,429	4.9	13,593	7,194	20,787	3,376,713	2,763	13.3	18,024
1925	457,477	4.3	14,472	5,195	19,667	3,785,547	2,624	13.3	17,043
Average		4.8						14.6	

LEAD PIGMENTS

Leaded zinc oxide, zinc-lead oxide, and basic lead sulphate or sublimed white lead and sublimed blue lead are made directly from

ore; white lead, red lead, orange mineral, and litharge are manufactured from pig lead. Zinc oxide is not classed as "leaded" by the Bureau of Mines if it contains less than 5 per cent of lead. These pigments are discussed and their output is given elsewhere in this volume in the chapter on lead and zinc pigments and salts.

The lead recovered from domestic and foreign ore in the form of pigments during recent years is given in the following table, which also gives the primary lead used in making those pigments that are made from pig lead and some secondary lead used in making leaded zinc oxide.

Quantity and source of lead in pigments,[1] 1921–1925, in short tons

Year	Domestic ore	Foreign ore	Primary metal [2]	Secondary metal [2]
1921	9,989	169	200,599	
1922	13,892		241,096	111
1923	13,612		236,541	
1924	15,338	545	250,930	
1925	17,547		256,064	

[1] Includes also lead recovered in zinc oxide and leaded zinc oxide.
[2] Primary metal is that made from ore; secondary metal is that derived from old metal and from drosses and skimmings.

SECONDARY LEAD

Secondary lead is obtained mainly from skimmings, drosses, old metal, and alloys, such as Babbitt, solder, and type metal. The recovery of lead by refining these materials constitutes an integral part of the lead industry and has recently increased in importance through the employment of the Harris refining process, the patent rights for which in the United States, with the exception of a single plant, have been acquired by the National Lead Co. The process is in operation at the Matawan, N. J., and Granite City, Ill., plants. From a mixture of scrap alloys, skimmings, and drosses, which contain antimony but no bismuth, antimonial lead that is claimed to be as good as new metal is recovered and in addition the remaining metals may be recovered as by-products.

Secondary lead recovered in the United States, 1921–1925, in short tons

Year	Pig lead	Lead in alloys	Total recovered lead	Value
1921	46,370	57,410	103,780	$9,340,000
1922	75,480	84,080	159,560	17,552,000
1923	96,430	98,060	194,490	27,229,000
1924	90,400	114,100	204,500	32,720,000
1925	112,420	114,460	226,880	39,477,000

MINE PRODUCTION

The preceding tables give the quantity of lead recovered by smelting and refining operations, either as metallic lead, or in the alloy antimonial lead, or as lead in pigments. The origin of the lead is much more accurately shown by the reports of mines, because

smelters necessarily treat mixtures of ores, sometimes long after they have been received, so that the actual output of metallic lead may not correspond at all closely to the product of the mines for the same year.

The following table gives the mine output of lead from 1916 to 1925. The figures represent the recoverable lead in ore mined in the different States, and are obtained by deducting an assumed loss in smelting and refining from the lead content of the ore. This loss in smelting and refining has been taken as 2 per cent in smelting (at plants with bag houses) the soft nonargentiferous lead ores of the Mississippi Valley, and about 5 per cent in smelting and refining the argentiferous lead ores of the Western States. That these assumed factors are close to the truth is shown by the small discrepancy between the mine and smelter output totals as disclosed in the table of comparison on page 201.

Figures for 1925 show the mine production of recoverable lead to be 684,439 short tons, an increase of about 88,000 tons, or 15 per cent, compared with 1924.

Missouri ranks first among the States in the mine production of lead. In 1925 her output was nearly one-third of the total for the country. Idaho held second place for many years but in 1925 Utah rose from third to second place, producing 31 per cent more than in 1924. All lead-producing States in the West except Montana made some increase in 1925, as compared with the preceding year.

Mine production of recoverable lead, 1916–1925, by States, in short tons

State	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925
Alaska	820	852	564	687	875	759	377	410	631	789
Arizona	12,854	11,146	5,939	4,847	6,935	3,271	7,535	8,146	9,321	11,938
Arkansas	267	374	118	27	8	21	42	25	20	58
California	5,893	10,387	6,351	1,695	2,407	562	3,156	4,775	2,382	3,283
Colorado	35,457	33,995	32,980	18,535	23,315	9,830	11,739	22,849	23,779	31,483
Georgia					2		4			
Idaho	178,164	186,941	139,981	86,612	118,565	99,235	97,917	121,178	124,475	126,521
Illinois	1,051	1,410	2,228	2,063	1,708	672	1,325	1,381	1,464	1,001
Iowa	14	33								
Kansas	1,615	2,965	7,107	11,057	16,452	18,679	23,271	17,598	18,560	22,775
Kentucky	150	121	181	84	120	69	92	53	175	152
Maine				1						
Massachusetts					14				(1)	
Missouri	228,426	229,473	190,292	160,024	161,812	180,085	178,412	169,743	189,929	211,566
Montana	6,458	10,427	17,640	16,358	14,846	10,183	14,884	17,973	19,738	18,765
Nevada	12,178	13,147	11,075	7,291	10,100	3,594	4,695	9,078	10,030	12,238
New Hampshire	47	48	30							
New Mexico	4,107	4,554	4,199	1,443	1,435	339	1,506	1,916	1,817	3,210
New York			29							
North Carolina		1								
Oklahoma	11,873	25,831	54,975	52,795	64,086	41,552	62,856	66,904	71,358	79,946
Oregon	13		4				38	14	(2)	3
Pennsylvania					7					
South Dakota	18	34	27	16	6	2				
Tennessee	15	2,404	1,620	2,079	1,880		732	1,250	937	448
Texas	25	1	13	7			4	13		8
Utah	95,708	84,798	79,329	58,819	66,898	44,594	67,666	101,724	116,955	153,335
Virginia	692	816	774						1,275	2,229
Washington	2,565	4,650	2,504	1,019	2,749	72	691	1,453	1,968	2,814
Wisconsin	2,982	4,056	4,442	4,130	2,594	972	691	734	1,254	1,877
	601,392	628,464	562,402	429,589	496,814	414,491	477,633	547,217	596,068	684,439

[1] It is said that a few tons of lead ore were mined at the old Chipman mine in Massachusetts, and were treated at a small smelter owned by the mine operators.
[2] 513 pounds.

COMPARISON OF MINE AND SMELTER TOTALS

A comparison of the mine production of recoverable lead and the smelter production of recovered lead in the United States from 1907 to 1923, showing the figures of smelter production in detail, was given in Mineral Resources, 1923. In less detailed form the following table covers a period of 19 years, and shows that the mine excess amounts to 103,545 tons, or 1.1 per cent of the total quantity recovered.

Domestic primary lead balance sheet, 1907–1925, in short tons

Year	Recoverable lead (mine production)	Recovered lead (smelter production)[1]	Mine excess (+) or smelter excess (−)	Year	Recoverable lead (mine production)	Recovered lead (smelter production)[1]	Mine excess (+) or smelter excess (−)
1907	364,715	365,506	−791	1918	562,402	563,606	−1,204
1908	330,237	326,657	+3,580	1919	429,589	443,954	−14,365
1909	385,113	367,393	+17,720	1920	496,814	500,093	−3,279
1910	382,692	391,543	−8,851	1921	414,491	414,886	−395
1911	426,585	407,767	+18,818	1922	477,633	488,448	−10,815
1912	442,126	410,228	+31,898	1923	547,217	567,247	−20,030
1913	483,113	435,474	+47,639	1924	596,068	593,486	+2,582
1914	504,769	537,696	−32,927	1925	684,439	684,968	−529
1915	542,098	536,355	+5,743				
1916	601,392	582,180	+19,212		9,299,957	9,196,412	+103,545
1917	628,464	578,925	+49,539				

[1] Includes smelter production of lead from argentiferous and nonargentiferous ores, lead in antimonial lead and in pigments, and lead recoverable from the small quantities of ore exported.

LEAD SMELTERS AND REFINERIES

UNITED STATES

California: Selby—Selby plant, American Smelting & Refining Co. (Smelter and refinery.)

Colorado:

Durango—Durango plant, American Smelting & Refining Co. (Smelter.)

Leadville—Arkansas Valley plant, American Smelting & Refining Co. (Smelter.)

Idaho: Kellogg—Bunker Hill & Sullivan smelter. (Smelter and refinery.)

Illinois:

Chicago—Goldsmith Bros.' Smelting & Refining Co.[2] (Smelter and refinery.)

Chicago—Great Western Smelting & Refining Co.[2] (Smelter.)

Chicago—U. S. Reduction Co.[2] (Smelter.)

Collinsville—St. Louis Smelting & Refining Works of National Lead Co. (Smelter and refinery.)

Federal—Federal plant, American Smelting & Refining Co. (Smelter.)

Indiana:

East Chicago—International Lead Refining Co.[4] (Refinery only.)

Grasselli—U. S. S. Lead Refinery (Inc.).[5] (Refinery only. Betts electrolytic process.)

Kansas: Galena—Galena plant, Eagle-Picher Lead Co. (Smelter.)

Missouri:

Granby—American Zinc, Lead & Smelting Co.[6] (Smelter.)

Herculaneum—St. Joseph Lead Co. (Smelter and refinery.)

Joplin—Eagle-Picher Lead Co. (Smelter.)

Montana: East Helena—East Helena plant, American Smelting & Refining Co. (Smelter.)

[2] Smelters of secondary materials but treating some lead ores.
[4] Subsidiary of Anaconda Copper Mining Co.
[5] Subsidiary of the United States Smelting, Refining & Mining Co.
[6] Plant idle in 1925.

Nebraska: Omaha—Omaha plant, American Smelting & Refining Co. (Refinery only. Betts electrolytic process.)
New Jersey:
Irvington—Irvington Smelting & Refining Co.[7] (Smelter and refinery.)
Newark—Balbach Smelting & Refining Co. (Smelter and refinery.)
Perth Amboy—Perth Amboy plant, American Smelting & Refining Co. (Smelter and refinery.)
Oklahoma: St. Louis—Ontario smelter, Eagle-Picher Lead Co. (Smelter.)
Pennsylvania: Carnegie—Pennsylvania Smelting Co. (Smelter and refinery.)
Texas: El Paso—Kansas City Consolidated Smelting & Refining Co.[8] (Smelter.)
Utah:
International Smelting Co.[9] (Smelter.)
Midvale—United States Smelting, Refining & Mining Co. (Smelter.)
Murray—Murray plant, American Smelting & Refining Co. (Smelter.)

CANADA

British Columbia: Trail—Consolidated Mining & Smelting Co. of Canada (Ltd.). (Smelter and refinery. Betts electrolytic process.)
Ontario: Galetta—Estate of James Robertson. (Smelter.)

MEXICO

Aguascalientes: Aguascalientes—American Smelting & Refining Co.[10] (Smelter.)
Chihuahua: Chihuahua—American Smelting & Refining Co. (Smelter.)
Coahuila:
Saltillo—Mazapil Copper Co. (Ltd.). (Smelter.)
Torreón—American Metal Co. (Ltd). (Cia. Metalúrgica de Torreón.) (Smelter.)
Durango: Asarco (Velardeña)—American Smelting & Refining Co. (Cia. Minera Asarco.) (Smelter.)
Guerrero: Campo Morado—Reforma Mining & Milling Co. (Smelter.)
Nuevo Leon:
Monterrey—American Metal Co. (Ltd.). (Cia. Minera de Peñoles—S. A.) (Smelter and refinery.)
Monterrey—American Smelting & Refining Co. (Smelter.)
San Luis Potosi:
Matehuala—American Smelting & Refining Co. (Cia. Minera Asarco.) (Smelter.)
San Luis Potosi—American Smelting & Refining Co. (Cia. Minera Asarco.) (Smelter.)

No important changes were reported during 1925 in operations at lead smelters in the United States. Trade journals have mentioned enlargements and improvements in several plants, including the International (Utah) plant of the International Smelting Co., and the East Helena (Mont.) and Durango (Colo.) plants of the American Smelting & Refining Co.

Extensions to the Trail, British Columbia, plant of the Consolidated Mining & Smelting Co. are said to have increased the capacity of the lead refinery from 185 to 350 tons a day.

La Fé smelter is being built by the American Metal Co. (Compania Minera de Peñoles, S. A.) on the grounds of La Fé milling plant owned by the Compania Internacional Minera, S. A. The site is about 7 miles south of the city of Zacatecas, N. L., Mexico. Approximately 60 per cent of the total receipts will be silver-lead concentrates, 30 per cent siliceous oxidized ores, and the remainder

[7] Smelters of secondary materials but treating some lead ores.
[8] Subsidiary of American Smelting & Refining Co.
[9] Subsidiary of Anaconda Copper Mining Co.
[10] Plant permanently closed and being dismantled.

lime flux. The blast furnace will have a capacity of 6,000 metric tons of charge (exclusive of secondaries and fuel) monthly. The output, estimated at 1,200 metric tons of lead-silver bullion per month, will be shipped to the Peñoles refinery in Monterrey for refining.

TRADE CONDITIONS

WORLD'S SMELTER PRODUCTION

The accompanying table, prepared by L. M. Jones, of the Bureau of Mines, shows the world's smelter production of lead from 1921 to 1925, so far as statistics are available. Official figures are used wherever possible. For countries for which official data are not yet available, the figures are taken from the yearbook of the American Bureau of Metal Statistics and other reliable sources, but the official statistics will be substituted as received.

There is always a possibility of duplication in figures showing world's production, for some countries send "work lead" or base bullion to other countries for refining. Furthermore, secondary and antimonial lead are often included in the figures showing the foreign production, so that to put the United States on an equal footing in the statistics it would be necessary to include in its production the domestic output of secondary lead and antimonial lead. The figures for the United States represent refined lead that was smelted in this country, whatever the source of the ore.

World's production of lead, 1921–1925

[In metric tons, by countries where smelted, but not necessarily refined]

Country	1921	1922	1923	1924	1925
Australia	51,452	105,126	132,165	128,657	148,474
Austria	3,347	3,360	4,255	4,985	5,408
Belgium	29,750	43,580	51,100	58,320	66,300
Canada	28,274	40,191	46,801	75,503	104,303
Czechoslovakia	2,388	2,228	2,452	2,264	2,050
France	15,475	13,944	17,413	18,880	20,000
Germany:					
Upper Silesia	13,743	[1] 6,188	([2])	67,427	([3])
Other Germany	70,487	59,100	56,110		50,000
Great Britain	2,474	5,036	6,815	5,387	4,811
Greece	5,575	4,408	4,235	5,106	4,602
India (Burma)	34,258	39,843	46,799	51,370	48,032
Italy	12,494	10,710	17,131	22,062	24,475
Japan	3,138	3,239	2,700	2,941	3,000
Mexico	58,586	114,235	121,607	131,113	157,900
Norway			242	642	406
Poland:					
Upper Silesia	([4])	[5] 8,325	16,256	16,205	27,420
Other Poland	1,010	50		([3])	
Rhodesia, northern	17,969	20,829	11,197	5,999	3,041
Rumania	363	230	402	433	496
Russia	([3])	394	555	[6] 625	[5] 823
South America	4,664	5,939	5,081	14,243	20,854
Spain	135,881	119,451	127,514	141,849	153,567
Sweden	513	315	223	586	725
Tunisia	12,225	14,552	14,090	14,291	16,013
Turkey	8,345	5,400	1,400	5,104	5,100
United States (refined)	367,718	437,845	515,395	555,913	636,790
Yugoslavia	4,828	8,497	9,260	11,487	10,956
Known production	885,000	1,073,000	1,211,000	1,341,000	1,516,000

[1] First six months; for second six months, see Poland.
[2] See Poland.
[3] Data not available.
[4] See Germany.
[5] Second six months; for first six months, see Germany.
[6] Data for operating year ended Sept. 30.

ECONOMIC POSITION OF THE LEAD INDUSTRY

The lead industry is not exempt from the operation of the law of supply and demand. Price, which is established by demand, either stimulates or depresses production. By virtue of its physical and chemical characteristics, lead has been adapted to many uses. As the price of lead has advanced certain uses have been eliminated by substitution and others have been greatly increased by growing demand. At present the world is seeing one of the greatest shifts in the uses of lead. The decline of its use in pigments has been accelerated by substitution and price. The demand for lead for those uses, such as storage batteries and cable sheathings, that in themselves are able to support a high price has aided this change; but the large consumption of lead by these comparatively new uses is not, as at first might appear, a serious drain on our diminishing lead resources. Such uses are not, broadly speaking, destructive, but year by year add to the stocks of metal which is not dissipated in use. As an example, lead from Roman and Phœnician conduits was later used for statuary and for pewter vessels. Again, it has been estimated that 80 per cent of the steel used in rails comes back to the melting pot within a comparatively few years. The loss of lead through use in storage batteries is said to be not more than 10 or 15 per cent. Thus much of the metal now going into use will be readily available for such other uses as the future may require.

No authentic statistics are available as to the total amount of lead in use in storage batteries, but a conservative estimate indicates that the total exceeds 400,000 short tons. In large cities lead is daily being placed in conduits. The only replacements heretofore made are by larger cables, so this stock of lead, and also of copper, is increasing steadily. There can be little question but that the city of New York has in its tunnels and conduits a larger metal reserve than many of the leading lead and copper mines. In the past large quantities of lead have been consumed in pigments, a destructive use from which there can be no recovery. As already stated, this use seems to be declining. Accompanying this decline there have been a more systematic collection of old stock and better methods for reclaiming the metal; these improvements have made possible an increase in the annual available supply of secondary lead.

During the past two years consumption has kept close pace with production and at times has created a shortage of spot lead; the price of lead has fluctuated greatly in times of shortage, doubts as to future supply have been augmented, and these conditions have been taken advantage of by the speculator. Fluctuations caused in this manner are injurious to both consumer and producer. Unless a trade is closely bound together, these fluctuations are to be expected; they can be obviated only by a high standard of organization that permits easy correlation of production and consumption.

The recent high prices of lead are the result of the spot demand for lead for storage batteries and cable sheathing. The mining industry was not prepared for this rapid increase in demand, which threw the whole industry out of balance and greatly stimulated production. As the production in other countries, especially Mexico,

Canada, and Bolivia, is more or less subject to the same influences as is the production of the United States, the lead-producing industries in these countries have benefited greatly. The postwar economic depression in Europe has greatly lessened lead consumption there. Had European demand been normal, prices would probably have been materially higher.

The rapid increase in the manufacture of electric cables in Germany has greatly stimulated the consumption of lead. It seems fair to assume that this increase in demand will continue for some time. The lead-producing industry of Europe has shown only a slight response to the higher price of 1925, mainly because of the economic exhaustion of the long-worked European deposits. Contributing factors have probably been the shortage of capital and labor, and the disarrangement of the pre-war economic units which administered the nonferrous metal business in Europe. In the western United States and in Canada recent improvements in ore concentration and metallurgy—the improved beneficiation of the highly refractory ores of zinc and lead—have notably increased production.

The sustained high price during 1925 greatly encouraged the search for new deposits and stimulated production from the older mining camps. The time necessary for the development of a mine, however, assures that several years will pass before the new deposits have any effect upon annual production, and it is questionable whether this new production will offset the loss of output from exhausted deposits. Maintained high prices will stimulate research for substitutes in many of the uses of lead, and this may ultimately result in curtailing consumption. At present there is no evidence of this condition becoming a reality, for during the 16-year period, 1910–1925, with an increasing price of lead the per capita consumption of virgin lead in the United States increased from 7.5 pounds in 1910 to 11.4 pounds in 1925.

IMPORTS AND EXPORTS

Lead remaining in warehouse in the United States, December 31, 1916–1925, in pounds

[Stated in the form in which the material was entered for warehouse]

Year	Ore	Base bullion	Pigs, bars, and old	Year	Ore	Base bullion	Pigs, bars, and old
1916	16,489,765	7,177,593	1,070,298	1921	13,679,465	24,692,350	693,440
1917	27,005,477	20,848,468	5,370,445	1922	10,470,144	7,076,544	----------
1918	12,805,167	21,192,655	944,483	1923	76,031,259	80,306,856	5,234,475
1919	29,543,811	61,408,873	468,154	1924	103,474,370	95,007,016	10,090,668
1920	32,923,299	69,517,026	2,644,576	1925	105,884,711	91,725,008	[1] 16,565,672

[1] Includes 241,078 pounds of lead in reclaimed scrap. Corresponding figures for earlier years are not recorded separately.

Lead imported for consumption in the United States, 1916–1925

Year	Lead in ore [1]		Base bullion		Pigs, bars, and old [2]		Sheets, pipe, and shot		Not otherwise specified	Total value
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value		
1916	10,125,983	$368,824	5,242,171	$208,277	6,388,097	$331,235	532	$63	$106,560	$1,014,959
1917	5,438,931	207,370	6,965,849	470,539	1,756,223	85,743	12,538	2,699	10,287	776,638
1918	6,064,902	344,080	3,559,071	180,070	1,139,950	56,694	6,892	624	36,723	618,191
1919	4,106,823	196,363	31,796,693	1,130,937	10,174,115	415,094	8,018	628	17,187	1,760,209
1920	13,700,499	908,619	66,816,820	3,340,600	68,901,959	3,887,821	81,396	5,483	21,328	8,163,851
1921	6,842,807	327,046	56,819,980	1,668,410	61,909,094	1,972,716	3,087	140	11,204	3,979,516
1922	23,649,851	812,603	55,859,422	1,815,142	8,563,110	335,924	6,018	697	12,286	2,976,652
1923	22,420,046	1,190,414	11,124,151	626,201	42,925,265	2,510,466	19,525	4,495	90,027	4,421,603
1924	65,147,976	3,145,791	28,796,402	1,542,167	27,362,392	1,850,862	11,666	4,384	138,637	6,681,841
1925	12,706,508	672,112	24,747,665	1,823,566	15,464,205	1,038,350	27,579	10,429	139,533	3,683,990

[1] Includes also lead in matte beginning Sept. 22, 1922.
[2] Includes also imports of antimonial lead, antimonial scrap lead, Babbitt metal, solder, etc., beginning Sept. 22, 1922, when new tariff went into effect, except in 1925 when antimonial lead is excluded.

Type metal imported for consumption in the United States, 1916–1925

Year	Type metal		Lead content	
	Pounds	Value	Pounds	Percentage
1916	1,162,386	$83,816	923,473	79.4
1917				
1918	551,794	35,938	513,166	93.0
1919	13,394,803	816,642	11,000,498	82.1
1920	29,887,353	1,349,495	25,761,543	86.2
1921	38,971,351	1,191,553	30,706,845	78.8
1922	44,895,120	1,120,814	33,944,199	75.6
1923	[1]	[1]	7,353,463	[1]
1924	[1]	[1]	1,288,766	[1]
1925	[2] 6,009,161	463,134	4,309,549	71.7

[1] Figures not available.
[2] Includes antimonial lead.

General imports of lead into the United States, 1916–1925, by classes, in pounds

Year	Lead in ore	Lead in base bullion	Pigs, bars, sheets, and old	Total lead content
1916	35,086,100	24,262,435	11,310,817	70,659,352
1917	41,292,876	103,664,970	11,585,974	156,543,820
1918	37,070,340	149,663,889	10,480,531	197,214,760
1919	19,573,856	112,024,518	10,214,753	141,813,127
1920	29,488,816	96,103,603	71,437,108	197,029,527
1921	14,234,039	71,733,838	62,602,534	148,570,411
1922	24,474,481	124,074,465	7,101,623	155,650,569
1923	66,882,850	161,496,495	42,198,848	270,578,193
1924	95,320,168	155,501,350	24,493,746	275,315,264
1925	88,962,502	141,253,559	14,042,369	244,258,430

The quantity of lead annually imported into this country in ore, base bullion, and as refined lead has been equivalent to one-fifth to one-fourth of the domestic production in the last five years. Some of the ore and bullion imported leaves the country later in the form of pig lead and in manufactured articles. The imports of lead in 1925 decreased 11 per cent as compared with those of 1924. Mexico is the chief source of supply.

General imports of lead into the United States, in ore, base bullion, and refined, 1916–1925, by sources, in pounds

Year	Canada	Mexico	South America	Europe	Other countries	Total
1916	12, 606, 216	48, 395, 670	6, 235, 758	575, 759	2, 845, 949	70, 659, 352
1917	11, 738, 379	125, 782, 759	4, 556, 460	8, 945, 899	5, 520, 323	156, 543, 820
1918	28, 225, 878	162, 259, 199	1, 962, 124	62, 510	4, 705, 049	197, 214, 760
1919	10, 391, 115	125, 541, 614	5, 504, 416	89, 840	286, 142	141, 813, 127
1920	8, 199, 234	131, 815, 278	7, 085, 351	38, 766, 504	11, 163, 160	197, 029, 527
1921	8, 127, 158	106, 406, 238	2, 381, 365	30, 224, 701	1, 430, 949	148, 570, 411
1922	8, 663, 236	141, 216, 136	3, 803, 478	1, 454, 384	513, 335	155, 650, 569
1923	11, 399, 671	242, 352, 788	5, 300, 161	11, 004, 938	520, 635	270, 578, 193
1924	11, 022, 091	243, 161, 069	15, 820, 867	4, 857, 805	453, 432	275, 315, 264
1925	11, 646, 820	218, 873, 800	10, 621, 737	1, 594, 963	1, 521, 110	244, 258, 430

The United States can not be ranked as an exporter of lead ore and bullion, for the shipments of domestic lead in these forms in the past 20 years were less than 9,000 tons—all of which went to Canada.

Exports of refined lead made from domestic ores began in 1914 when the price of lead at London rose above the price at New York. The table below shows the growth of such exports during the war and their subsequent decline.

Refined lead, made from domestic ores, exported from the United States, 1914–1925

Year	Short tons	Value	Year	Short tons	Value
1914	58, 722	$4, 501, 674	1920	2, 730	$462, 223
1915	88, 306	7, 923, 518	1921	1, 624	177, 926
1916	100, 500	13, 494, 065	1922	5, 823	604, 605
1917	53, 688	9, 560, 598	1923	1, 999	260, 487
1918	41, 831	5, 889, 381	1924	5, 332	711, 147
1919	10, 510	1, 471, 256	1925	4, 955	784, 440

Exports of refined lead and of manufactured articles produced from foreign ore reached their highest figure in 1925, when they amounted to 98,564 short tons, an increase of 28 per cent over 1924. Nearly one-half of the amount exported went to the United Kingdom.

Foreign lead exported from the United States, 1916–1925

Year	Exported from warehouse			Exported in manufactures with benefit of drawback (pounds)
	Pigs, bars, and old [1]		All other manufactures	
	Pounds	Value		
1916	19, 760, 086	$1, 111, 653	$541	10, 341, 075
1917	75, 304, 480	6, 650, 157	900	15, 074, 947
1918	118, 832, 344	8, 309, 798	4, 347	6, 852, 173
1919	81, 951, 396	4, 536, 273	44	3, 872, 130
1920	34, 725, 501	2, 570, 535	35, 146	12, 350, 794
1921	50, 000, 259	2, 284, 107	613	18, 738, 927
1922	64, 709, 305	3, 177, 360	146	11, 354, 070
1923	97, 471, 326	5, 195, 256	[2]	25, 052, 107
1924	153, 515, 863	9, 685, 619	[2]	30, 549, 116
1925	197, 128, 517	14, 910, 891	[2]	23, 398, 305

[1] Since July 1, 1915, the Bureau of Foreign and Domestic Commerce has classed all foreign lead smelted or refined in this country and exported as "domestic exports of pigs, bars, etc., produced from foreign ore." The above figures include also the exports of foreign lead imported in the form of pigs and bars.

[2] Not separately classified after 1922.

Domestic and foreign pig lead exported from the United States, 1924–25, by destinations

[Figures in parentheses are not duplicated in the totals]

Destination	Domestic		Foreign	
	Short tons	Value	Short tons	Value
1924				
Asia	33	$5,650	2,353	$287,397
Japan			(2,072)	(256,427)
Philippine Islands	(30)	(5,037)	(1)	(158)
Canada	120	23,476	(1)	56
Cuba	105	17,308	126	16,220
Europe	3,870	483,571	70,271	8,870,351
France	(1,116)	(130,356)	(10,899)	(1,400,908)
Germany			(10,069)	(1,210,009)
Netherlands	(588)	(69,893)	(2,340)	(288,780)
United Kingdom	(2,096)	(274,902)	(38,063)	(4,887,487)
Mexico	45	10,569	35	4,677
Panama	39	6,477		
South America	1,066	153,217	3,958	504,084
Argentina	(695)	(87,584)	(1,327)	(164,065)
Brazil	(250)	(43,036)	(2,418)	(312,471)
Uruguay	(3)	(571)	(140)	(17,547)
Other countries	54	10,879	15	2,834
	5,332	711,147	76,758	9,685,619
1925				
Asia	64	13,071	1,833	262,508
Japan			(1,344)	(190,867)
Philippine Islands	(52)	(10,888)	(19)	(4,182)
Canada	167	31,721		
Cuba	183	29,589	103	15,438
Europe	2,939	448,194	92,662	14,028,923
France	(812)	(125,682)	(8,586)	(1,264,196)
Germany	(347)	(53,454)	(25,830)	(3,940,485)
Netherlands	(560)	(86,144)	(4,654)	(704,681)
United Kingdom	(224)	(35,014)	(45,683)	(6,916,744)
Mexico	65	13,559	59	9,301
Panama	126	24,130	25	4,393
South America	1,345	210,807	3,877	589,415
Argentina	(344)	(51,503)	(1,473)	(220,643)
Brazil	(174)	(29,402)	(2,113)	(321,625)
Uruguay	(392)	(57,115)	(137)	(19,762)
Other countries	66	13,369	5	913
	4,955	784,440	98,564	14,910,891

[1] Less than 1 ton.

CONSUMPTION

Apparent consumption of refined primary lead in the United States, refinery stocks disregarded, 1916–1925, in short tons

	1916	1917	1918	1919	1920
Supply:					
Stock in bonded warehouse Jan. 1		535	2,685	472	234
Imports of pigs, bars, and old	5,655	5,793	5,240	5,107	35,719
Production	571,134	610,769	640,195	482,220	529,657
	576,789	617,097	648,120	487,799	565,610
Withdrawn:					
Exports of foreign lead—					
From warehouse	9,880	37,652	59,416	40,976	17,363
In manufactures, with benefit of drawback	5,171	7,537	3,426	1,936	6,175
Exports of domestic lead	100,500	53,688	41,831	10,510	2,730
Stock in bonded warehouse Dec. 31	535	2,685	472	234	1,322
	116,086	101,562	105,145	53,656	27,590
Apparent consumption	460,703	515,535	542,975	434,143	538,020

Apparent consumption of refined primary lead in the United States, refinery stocks disregarded, 1916–1925, in short tons—Continued

	1921	1922	1923	1924	1925
Supply:					
Stock in bonded warehouse Jan. 1	1,322	347	----------	2,617	5,045
Imports of pigs, bars, and old	31,301	3,551	21,099	12,247	7,021
Production	448,589	532,662	618,322	690,493	766,969
	481,212	536,560	639,421	705,357	779,035
Withdrawn:					
Exports of foreign lead—					
From warehouse	25,000	32,355	48,736	76,758	98,564
In manufactures, with benefit of drawback	9,369	5,677	12,526	15,275	11,699
Exports of domestic lead	1,624	5,823	1,999	5,332	4,955
Stock in bonded warehouse Dec. 31	347	----------	2,617	5,045	8,162
	36,340	43,855	65,878	102,410	123,380
Apparent consumption	444,872	492,705	573,543	602,947	655,655

PRICES AND VALUE

The average quoted price of lead for prompt delivery at New York in 1925, according to the American Metal Market, monthly review section, was 9.1 cents a pound (the highest annual average quoted price on record), compared with 8.3 cents in 1924. The quotation on January 2 was 10.25 cents a pound, and by the middle of the month was 10.75 cents—the highest quotation of the year. The quoted price steadily declined to 7.65 cents on April 22—the lowest quotation of the year. The general trend thereafter was upward, although there were some slight fluctuations downward. In August the quotation remained at 10 cents for nearly two weeks. It again declined, then rose to the same price for a few days in November, and closed the year at 9.37½ cents.

The following table gives the average quotations on lead, outside market, New York, 1923 to 1925, and in London, 1925, by months:

Average monthly quoted price of lead at New York, 1923–1925, and at London, 1925, in cents a pound[1]

Month	At New York (outside market)			At London,[1] 1925	Month	At New York (outside market)			At London,[1] 1925
	1923	1924	1925			1923	1924	1925	
January	7.84	8.43	10.33	8.84	July	6.25	7.19	8.31	7.53
February	8.21	9.18	9.41	8.09	August	6.64	7.95	9.81	8.23
March	8.45	9.33	8.90	7.84	September	6.87	8.07	9.61	8.43
April	8.32	8.20	8.02	7.03	October	6.87	8.37	9.68	8.43
May	7.41	7.32	8.20	7.00	November	6.81	9.01	9.84	7.96
June	7.18	7.01	8.44	7.27	December	7.59	9.62	9.40	7.52

[1] American Metal Market, monthly review section.
[2] Conversion of English quotations into American money based on average monthly rate of exchange, as recorded by the Federal Reserve Board of the Treasury.

The following are the prices quoted on lead at New York in 1925 by the American Smelting & Refining Co., in cents a pound:

Jan.	2	9.75	Apr.	18	7.85	July	30	8.30
	5	10.00		21	7.75	Aug.	3	8.50
	8	10.25	May	14	7.90		5	8.75
	12	10.50		19	8.00		8	8.90
	21	10.00		22	8.15		11	9.00
	30	9.75		25	8.25		13	9.15
Feb.	13	9.50		28	8.40		14	9.25
	17	9.25	June	18	8.30		19	9.40
Mar.	3	9.00		24	8.20		26	9.50
	26	8.75		29	8.10	Nov.	2	9.75
	30	8.50		30	8.00		30	9.50
Apr.	7	8.25	July	20	8.10	Dec.	8	9.25
	16	8.00		21	8.20			

The average selling price of lead in 1925, based on total sales by producers, was 8.7 cents a pound, which compares with 8 cents in 1924 and 7 cents in 1923. The value of refined lead produced in the United States from domestic ores, calculated at the average selling price a pound, was $113,956,000 in 1925, compared with $90,625,000 in 1924 and $76,138,000 in 1923.

SECONDARY METALS

By J. P. Dunlop[1]

INTRODUCTION

SCOPE OF REPORT

"Secondary metals" are those recovered from scrap metal, sweepings, skimmings, and drosses, and are so called to distinguish them from metals derived directly from ores which are termed "primary metals." The distinction does not imply that secondary metals are of inferior quality, for metals derived either from ore or from waste material vary in purity and in adaptability to use in making certain products. The figures furnished by producers cover seven metals—secondary copper, zinc, lead, tin, antimony, aluminum, and nickel—and are supplemental to those on the primary metals. They are given to enable producers and consumers to form a more comprehensive idea of the quantities of metal available for consumption; in fact, they constitute an essential addition to the figures given in the general reports on the primary metals.

RECOVERY OF WASTE MATERIAL

The collection of waste material is an established branch of industry. It involves the collection, sorting, and shipment of waste having an estimated value of more than a billion dollars yearly; it has advanced in honesty, efficiency, and usefulness, and it is growing rapidly. Every year larger and better-equipped plants handle the material, and technical methods of handling and using waste are rapidly superseding ignorance and guesswork. The smaller plants are being forced out of business.

Few people realize the ramifications of the trade in waste materials; few realize its importance in keeping down costs of many products, such as containers; few realize how the prices of metals and of many other commodities would soar if waste products did not supplement the stocks of primary materials. The advertisements in trade papers devoted to waste materials show a steady demand for classes of waste never heard of by the ordinary individual. Some of these classes of material are set forth in the "Secondary metals" report for 1924. This report covers only a part of the waste metals of certain classes and only a very small part of the wide variety of waste materials that are marketed. Although the use of scrap metals has increased

[1] Figures on imports and exports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

at local foundries in country districts the last few years, shipments to large smelting centers from country districts have not shown any notable advance, for costs of collection are still too high.

Buyers and sorters of waste products must possess considerable ability in handling, sorting, shipping, and selling. The variety of waste metals and the differences in composition are bewildering and new alloys are being increasingly used. The grades and the character of the materials used by consumers vary not only with officially adopted classifications but with individual preferences and requirements.

Much of the waste from country collections requires careful sorting, and this is not easy to do by visual examination alone when there are so many alloys used in various products. Lower prices primarily are paid for small, unsorted lots of waste metal than for scrap metals that have been carefully sorted and graded at large plants. Every year an increased number of foundries and metal-working establishments carefully segregate all waste made at their plants. The expense of doing this is quickly returned in the better prices obtained for waste metals sold.

The chapters on "Secondary metals" in Mineral Resources for 1918 to 1924 contain much information regarding the collection of waste material. Various trade papers, such as the Waste Trade Journal, Daily Metal Trade, Brass World, American Metal Market, Foundry, Iron Age, Iron Trade Review, Metal Industry, and Daily Metal Reporter, also contain valuable information relating to prices and marketing of scrap metal and drosses and technical information relating to the proper use of old metals.[2]

CLASSIFICATION OF OLD METALS

The classification of old metals drawn up by the metal division of the National Association of Waste Material Dealers (Inc.) (Times Building, New York, N. Y.) and changed from time to time as desirable has become the standard with both dealers and manufacturers all over the United States. The latest classification (Circular H), which is effective from July 1, 1925, made numerous changes in the standard classification of old metals. Other changes may be made in 1926, but none have been promulgated up to September, 1926.

Standard Classification for Old Metals, Effective from July 1, 1925

1. *Delivery.*—(*a*) Delivery of more or less on the specified quantity up to 2½ per cent is permissible.

(*b*) If the term "about" is used, it is understood that 5 per cent, more or less, of the quantity may be delivered.

(*c*) Should the seller fail to make deliveries as specified in the contract, the purchaser has the option of canceling all of the uncompleted deliveries or holding the seller for whatever damages the purchaser may sustain through failure to deliver; and if unable to agree on the amount of damages, the arbitration committee of the National Association of Waste Material Dealers (Inc.), appointed for this purpose, to determine the amount of such damages.

(*d*) In the event that buyer should claim the goods delivered on a contract are not up to the proper standard, and the seller claims that they are a proper delivery, the dispute shall be referred to the arbitration committee of the

[2] Metal Industry, "Value of a business publication": July, 1926, p. 290.

National Association of Waste Material Dealers (Inc.), to be appointed for that purpose.

(*e*) A contract for a carload, unless otherwise agreed upon, shall mean the minimum quantity recognized by the official classification tariff of the district in which the seller is located.

(*f*) A ton shall be understood to be 2,000 pounds, unless otherwise specified.

(*g*) If through embargo a delivery can not be made at the time specified, the contract shall remain valid and shall be completed immediately on the lifting of the embargo, and terms of said contract shall not be changed.

(*h*) In case of a difference in weight and the seller is not willing to accept buyer's weights, a sworn weigher shall be employed, and the party most in error must pay the costs of handling and weighing.

(*i*) In items below where it is provided that one or more grades shall be included, it is understood that all or any of those grades shall be considered a proper delivery.

(*j*) When material is such that it can be sorted by hand, consignees can not reject the entire shipment if the percentage of rejection does not exceed 10 per cent. The disposition of the rejected material should then be arranged by negotiations; no replacement of the rejected material to be made.

2. *Heavy copper.*—This shall consist of copper not less than one-sixteenth inch thick and may include trolley wire, heavy field wire, heavy armature wire that is not tangled, and also new copper clippings and punchings, untinned and clean, and copper segments that are clean.

3. *No. 1 copper wire.*—To consist of clean untinned copper wire not smaller than No. 16 B. & S. wire gauge; to be free from burnt copper wire which is brittle and all foreign substances.

4. *No. 2 copper wire.*—To consist of miscellaneous clean copper wire such as of necessity would be taken out of the heavy copper and the No. 1 copper wire, but to be free of hair and burnt wire which is brittle.

5. *Light copper.*—Shall consist of the bottoms of kettles and boilers, bathtub linings, hair wire, burnt copper wire which is brittle, roofing copper, and similar copper, free from radiators, brass, lead, and solder connections, readily removable iron, old electrotype shells, and free of excessive paint, tar, and scale.

6. *Composition or red brass.*—Shall consist of red scrap brass, valves, machinery bearings, and other parts of machinery, including miscellaneous castings made of copper, tin, zinc, and/or lead; no piece to measure more than 12 inches over any one part; not to weigh over 60 pounds; to be free of aluminum and manganese, and also free of railroad boxes, cocks and faucets, gates, pot pieces, ingots, and burned brass.

7. *Railroad bearing.*—Shall consist of railroad boxes or car-journal bearings; must be old standard used scrap; free of yellow boxes, also iron-backed boxes and must be free of babbitt; also free of excessive grease and dirt.

8. *Cocks and faucets.*—To be mixed red and yellow, free of gas cocks and beer faucets; shall be at least half red.

9. *Heavy yellow brass.*—Shall consist of heavy brass castings, rolled brass, rod brass ends, brass screws, and tinned or nickel-plated brass tubing; to be free of iron and dirt, and must be in pieces not too large for crucibles; no piece to measure more than 12 inches over any one part; must be free of manganese mixtures and condenser tubes; must be free of aluminum brass containing over 0.20 per cent aluminum.

10. *Yellow brass castings.*—Shall consist of brass castings in crucible shape; that is, no piece to measure more than 12 inches over any one part; must be free of manganese mixtures and must not contain over 0.20 per cent aluminum.

11. *Light brass.*—Shall consist of light sheet brass forks and spoons, miscellaneous brass that is too light for heavy; to be free of any visible iron, radiators, gun shells containing paper, ashes, or iron, loaded lamp-bases, and clockworks.

12. *New brass clippings.*—Shall consist of the cuttings of new sheet brass; to be absolutely clean and free from any foreign substances.

13. *Brass tubing.*—Shall consist of brass tubing, free of nickel plating, tinned, soldered, or tubes with cast-brass connections; to be sound, clean tubes, free of sediment and condenser tubes.

14. *No. 1 red composition turnings.*—To be free of plastic, railroad car box turnings, aluminum, manganese, and yellow brass turnings; not to contain over 2 per cent free iron; to be free of grindings and foreign material, especially babbitt. Turnings not according to this specification to be sold subject to sample.

15. *No. 1 yellow rod brass turnings.*—Shall consist of strictly rod turnings, free of aluminum, manganese, composition, Tobin and Muntz metal turnings; not to contain over 3 per cent free iron, oil, or other moisture; to be free of grindings and babbitts; to contain not more than 0.30 per cent tin and not more than 0.15 per cent combined iron.

16. *No. 1 yellow brass turnings.*—Shall consist of strictly rod turnings, free of aluminum, manganese, composition, and Tobin turnings; not to contain over 3 per cent of free iron, oil, or other moisture; to be free of grindings and babbitts. To avoid dispute, to be sold subject to sample.

17. *No. 1 pewter.*—Shall consist of tableware and soda-fountain boxes, but in any case must test 84 per cent tin. Siphon tops to be treated for separately.

18. *Auto radiators (copper and brass).*—Ford, 2 pounds deduction on a Ford plate; three-quarters pound for each iron water connection; 1 pound for each side sheet-iron strip. All other radiators to be subject to deductions for actual iron.

19. *Zinc.*—Must consist of clean sheet and cast zinc; also cast batteries, to be free of loose oxide and dross, sal ammoniac cans, and other foreign materials.

20. *Tin foil.*—Shall consist of pure foil free of lead composition and other foreign ingredients and matters.

21. *Electrotype shells.*—Must be hand picked and free of loose dross and chunks of dross.

22. *Battery lead plates.*—Shall consist of dry-battery lead plates; moisture not to exceed 1 per cent; allowance to be made for wood, rubber, paper, and excess moisture.

23. *New sheet aluminum clippings.*—Shall consist of new sheet aluminum and cuttings; must be free from oil, grease, and any other foreign substances; must be guaranteed not less than 98 per cent pure aluminum.

24. *Aluminum wire.*—Shall consist of aluminum wire guaranteed 98 to 99 per cent pure aluminum, and must be free from corrosion and any other foreign substance.

25. *Painted sheet aluminum.*—Shall consist of painted sheet aluminum, and must be absolutely free from iron, dirt, or any other foreign substance.

26. *Aluminum castings.*—Shall consist of aluminum castings, free from iron, babbitt, brass, and any other foreign substance; must not exceed 2 per cent of oil and grease.

27. *Old sheet aluminum.*—Shall consist of old and manufactured sheet aluminum; must be free from painted sheet aluminum, iron, dirt, and any other foreign substance.

28. *Aluminum borings.*—To avoid dispute, should be sold subject to sample.

29. *Aluminum foil.*—Shall consist of pure aluminum foil, free from paper and any foreign ingredients.

30. *Babbitt metal.*—Shall contain bearing metal of all kinds; shall not contain scrap hard metal, Allen metal (which is copper and lead alloy), die cast, zinc boxes, or type metal.

31. *Monel-metal scrap.*—Must be in sheets, clippings, castings, bars, or rods; must be free of iron and other foreign materials. To avoid disputes, to be sold subject to sample.

32. *Monel-metal turnings.*—Must be free of iron and undue percentage of oil and moisture. To avoid disputes, to be sold subject to sample.

33. *Packages.*—Shall be good, strong packages, suitable for shipment, and each package to be plainly marked with the gross and tare weights, so that when packages reach their destination their weights can be easily checked. When goods are not packed according to the above specifications, and shipper wants his rejections returned, the cost of labor shall be charged to the shipper.

The new specifications of German scrap-metal dealers, issued in Berlin, June 30, 1926,[3] may be of interest to exporters of scrap metals:

The general assembly of the Association of Metal Traders has issued the following revised specifications on scrap metals:

NOTE.—In all red brass and bronze materials 10 per cent of the tin content can be tolerated for antimony and can be added to the tin content.

[3] Waste Trade Journal, "German scrap metal dealers issue new specifications": July 19, 1926.

Old red brass (*machine red brass*).—Must be composed of parts of castings whose alloy is to contain 85 per cent copper plus tin. The tin content may not be under 4 per cent nor the copper content under 78 per cent. The rest may contain lead and zinc.

Marine bronze.—Must be composed of parts of vessels whose alloy contains at least 92 per cent copper plus tin. A lead content up to 2 per cent is permitted.

Heavy brass (*cast brass*).—Must be composed chiefly of cast brass parts, strong sheet and pipe sections, and must be free from adhering iron. The goods shipped must contain on an average at least 60 per cent copper and 34 per cent zinc.

New hard brass scrap.—Must be composed of waste coming from the working of rolled brass sheet.

Light brass.—Is made of old brass objects, which may be tinned, soldered, and galvanized. It must be as free from iron as possible.

Brass screw filings.—Must contain at least 57 per cent copper. The rest of the alloy is to be chiefly zinc.

Brass pipe.—Must not be tinned and must be as free as possible from dirt and boiler scale; 2 per cent dirt and boiler scale are allowed. Condenser pipes may be shipped only if they are free of tin.

Brass cartridges.—Must be clean and in one piece, free of powder and iron. They must not have any oxidation to speak of.

Prime block brass.—Must contain at least 64½ per cent copper. The rest is to be zinc, yet the presence of foreign bodies in the alloy is permitted up to 5 per cent harmful content of nickel, manganese, and aluminum. Prime block brass must be filed and show a greenish yellow color in the cracks.

Fire-box copper.—May be derived only from old locomotive fire boxes and must not contain any manganese copper. No more than 10 per cent of the shipment may contain loose rivets or bolts.

Heavy copper.—May be composed only of old heavy copper, strong copper waste, and new copper sheet scrap. Only 10 per cent may contain tinned copper.

Old electrolytic copper and electrolytic copper wire.—Must be composed of pure electrolytic copper. Material with solder may not be shipped.

Light copper.—Copper utensils of any kind, mixed copper wire, and light copper scrap may be shipped as light copper. It must be free from iron.

Copper filings.—Must be composed of filings of pure copper and must contain no foreign admixtures.

Remelted zinc.—Must be molten out of regular sheets of old zinc and contain at least 96 per cent zinc.

Old zinc.—May not have more than 1 per cent iron.

New zinc scrap.—Must be made of new, clean, solder-free zinc scrap.

Old lead.—Must be mostly composed of soft lead or scrap.

Old soft lead.—Must be made of old lead objects and contain at least 99 per cent lead. Alloys or other admixtures are not permissible.

Block lead.—Must contain at least 97 per cent lead. The rest may be antimony, copper, tin, and zinc, but the last two metals together may not come to more than three-fourths per cent.

Mixed tin.—Must be the properly produced tin-lead alloy and contain at least 54.4 per cent tin and a content of antimony up to 3.6 per cent and of copper up to 0.15 per cent must be tolerated. Goods must be technically free from iron, arsenic, and zinc.

New clean aluminum sheet waste.—Must be unvarnished, clean, not oxidized, and free from all foreign metals. No aluminum leaf or foil waste must be included, but aluminum wire may be present up to 20 per cent with 98.99 per cent aluminum.

REVIEW OF THE SECONDARY METAL INDUSTRY IN 1925

MARKET CONDITIONS

The most significant feature of the secondary metal trade in 1925 was the large expansion in the quantity and value of certain classes of scrap metals and drosses. Notwithstanding an increase

in the quantity of scrap copper and scrap brass exported, the quantity of virtually all the secondary metals reported to the Bureau of Mines as used by domestic refineries and smelters increased.

The recoveries of secondary copper, lead, zinc, antimony, aluminum, and nickel increased in 1925 both in quantity and in value. The quantity of secondary tin was nearly as large as in 1924, and the value increased more than $4,000,000. The average price of all the above metals was greater in 1925 than in 1924. The increase in total value from 1924 was $42,992,100, or 21 per cent, and the increase in total quantity of metals and alloys recovered was 8 per cent. There was a decrease in brass scrap remelted. As tin and lead were high in price and lead was sometimes scarce, there was an active demand for white-metal alloys and drosses. Battery plates and mud were especially active, and the offerings were below requirements. The supplies of secondary copper and brass were ample in most sections throughout 1925, though the export demand for yellow brass scrap, new brass clippings, and turnings was good during most of 1925. The continuation of record-breaking building operations, the scrapping of many miles of nonprofitable electric and steam railways, the extensive repair programs of the railways, and the good purchases of scrap metals and of alloys made from scrap by the foundries in most sections of the United States created much business for waste-metal products.

Scrap-metal dealers and smelters did a large business in 1925 and, on the whole, a prosperous one, though profits on a basis of turnover probably were less than in 1924. Competition was very keen for most grades of scrap metals, and the margin of profit in covering orders was very small in many cases, especially in the first half of 1925. There was less leniency shown by smelters and refiners in interpreting grades and packing specifications. Some of the difficulties were caused by the presence of lead in copper, of moisture content in battery plates, and of allowances for iron in automobile radiators. Foreign consumers also raised some trouble regarding quality of materials and packing standards. Export business was partly restricted because of continued financial difficulties in Europe.

Waste-trade circles have devoted considerable time to discussion of the trouble with the waste-material business. It is the consensus of opinion that competition in the smelting and refining of old metals and drosses has been so keen that much business is being done at a loss, and that ingot metal made from scrap is being sold at an increasingly lower price than the selling price of new pig metal.

There was a record trade in scrap iron and steel in 1925, but the complaint is general that profits were very small; that many large and small dealers in ferrous metals went out of business; and that only a few dealers made any substantial profit. It is the general opinion that some scrap-iron dealers do not know the cost of doing business and depend too much on speculative advance and not on buying, sorting, and shipping so as to realize a gross profit of about 10 per cent.

Domestic smelters and foundries are steadily tending to use larger percentages of scrap metals and employ more exact technical super-

vision. Many railroad companies and motor-car manufacturers have established reclamation departments that make some use of virtually every bit of old material, thus saving enormous sums of money. Most large producers of scrap now sort and classify their own scrap metals, reuse all they possibly can, and partly, at least, prepare the remainder for the market, thus getting better prices. Although there has been no general decrease in the recovery or use of scrap metals in any region, there have been very large increases in certain areas, such as around Detroit and Cleveland. The automotive industry creates large quantities of scrap metals, and in the last two years the secondary smelters in the Lake region have increased in size and number. In California there has also been an extension of scrap collections and in the number of plants remelting, refining, and reusing scrap and drosses. There has been no great increase in other Pacific States and in the Central States.

Many authorities in the waste-material trade believe that, on the whole, secondary metal dealers and smelters do not give enough consideration to the cost of collecting, sorting, remelting, and refining scrap; that too much is frequently paid for scrap and drosses, so that the only opportunity for a profitable sale is to gamble on an advance in market prices of metals. Undoubtedly many of the small dealers and smelters have been forced out of business. To seek some remedy for many problems confronting the makers of ingot from scrap metals, the Brass Ingot Manufacturers Association was formed in March, 1926, as a division of the National Association of Waste Material Dealers. The association, of which Benjamin Harris, of Chicago, is president, seeks all brass-ingot makers in the United States as members, and proposes an extensive study of costs and other subjects. There are about 1,000 brass foundries in the United States, and the general tendency of late years has been to stop making brass ingots and to buy them from large manufacturers. However, the large users of brass, such as automobile companies, railroad companies, etc., tend more and more to make their own ingots. As industrial plants in the United States operated at nearly 85 per cent of capacity during the first part of 1926, there is no indication of a slump in any large scrap-producing or scrap-using branch of trade, so it is safe to predict that the value of secondary metals produced and used in 1926 will not be less than in 1925, though the average price of some of the scrap metals will be lower.

PRICES OF SOME SCRAP METALS AND ALLOYS

The dealers' weekly average buying price in New York of heavy scrap copper decreased from 12.75 cents a pound in January, 1925, to 12.35 cents at the end of February. It declined in March to 11.75, in April dropped to 11.10 cents, then advanced to 11.35 in May, and declined to 11.25 cents in June. In July the price advanced to 12.10 cents; in August the price advanced as high as 12.25 cents, and was fairly stable until the end of September, when it declined to 12.10 cents. During October the price ranged from 11.75 cents to 12.10 cents and sharply advanced to 13 cents the middle of Novem-

ber. Prices dropped to 11.75 at the end of November and to 11.25 in the middle of December. The market price was stronger the last two weeks of December and closed at 11.75 cents. The lowest price in 1925 was 11.10 cents a pound in April and the highest price 13 cents in November.

No. 1 composition scrap (red brass) showed a range of 1.75 cents a pound in 1925. It began at 9.75 cents in January, was highest at 10.25 cents the third week in January, and lowest at 8.50 cents at the beginning of April.

The price of heavy lead scrap began the year at 8.60 cents a pound and reached 9 cents, the high point of the year, during the next two weeks. In April 6.35 cents a pound was paid, the lowest price for 1925. The upward trend that began in May and continued until November was followed by a reaction in December. The range of prices during the year was 2.65 cents.

The range in the price of scrap zinc was 1.25 cents. The price was 4.75 cents a pound in January and as low as 4.25 cents in April, May, and June, advancing sharply to 4.85 cents in July and continuing to 5 cents in August. The price rose to 5.25 cents in September but slumped at the end of the month. October prices were firmer, reaching 5.25 cents late in the month. November established a price of 5.50 cents, then a slight reaction occurred in December, when the price declined to 5.25 cents.

The price of secondary tin usually followed the trend of prices for primary tin, which had a range in 1925 of 13.63 cents. Block-tin pipe was quoted as high as 55.53 cents a pound in November and as low as 44.19 cents in April.

The prices of scrap aluminum and No. 12 alloys were variable, and the quotations for scrap aluminum castings ranged from 17.25 cents a pound early in 1925 to 20 to 21 cents during November and December. New aluminum clippings ranged in price from 24 and 25 cents a pound to 21.5 cents. The highest average monthly price was in December and the lowest in March.

Antimonial lead scrap, especially old battery plates, was in active demand at strong quotations, owing to the high price of lead and the unusual advance in the price of primary antimony.

Scrap nickel and alloys containing nickel were in much greater demand than in 1924, and the prices closely followed those for primary nickel, which advanced from 31 cents in the period January to June to 34 cents in July and August, 33 to 34 cents in August, September, and October, and 34 cents in November and December.

Average scrap-metal prices, 1925, in cents per pound[1]

[New York dealers' weekly average buying prices]

Date	Heavy copper	No. 1 composition	Heavy lead	Scrap zinc	Cast aluminum	Date	Heavy copper	No. 1 composition	Heavy lead	Scrap zinc	Cast aluminum
Jan. 3	12.60	9.75	8.60	4.75	17.25	July 4	11.35	9.00	7.00	4.50	17.60
10	12.75	10.00	9.00	4.75	17.50	11	11.60	9.25	7.00	4.60	17.75
17	12.75	10.25	9.00	4.75	17.50	18	12.00	9.60	7.35	4.75	17.75
24	12.35	9.85	8.50	4.75	17.75	25	12.10	9.60	7.50	4.85	17.75
31	12.50	9.85	8.25	4.75	17.50	Aug. 1	12.00	9.25	7.50	4.75	18.25
Feb. 7	12.25	9.50	8.00	4.60	17.25	8	12.25	9.50	7.75	4.75	18.75
14	12.50	9.75	7.75	4.60	17.50	15	12.20	9.35	8.20	5.00	18.75
21	12.50	9.35	7.50	4.60	17.50	22	12.25	9.50	8.50	5.00	18.75
28	12.35	9.60	7.35	4.60	17.75	29	12.20	9.25	8.35	5.00	19.25
Mar. 7	12.20	9.25	7.10	4.35	17.25	Sept. 5	12.00	9.50	8.25	4.75	20.00
14	12.00	9.10	7.10	4.35	17.25	12	12.25	9.25	8.00	5.25	19.25
21	11.75	8.60	7.25	4.50	17.35	19	12.20	9.25	8.00	5.25	19.25
28	11.75	8.60	7.10	4.50	17.35	26	12.10	9.10	8.00	5.00	19.35
Apr. 4	11.10	8.50	6.85	4.25	17.35	Oct. 3	11.85	9.00	8.00	5.00	19.35
11	11.25	8.75	6.85	4.25	17.35	10	11.85	9.00	8.20	5.10	19.50
18	11.10	8.60	6.85	4.25	17.35	17	12.10	9.10	8.20	5.10	19.50
25	11.20	8.75	6.35	4.25	17.50	24	11.75	9.10	8.20	5.25	19.50
May 2	11.35	9.00	6.60	4.25	17.50	31	12.10	9.25	8.20	5.25	20.00
9	11.35	9.00	6.75	4.25	17.35	Nov. 7	12.25	9.25	8.50	5.25	20.25
16	11.35	9.00	7.00	4.25	17.25	14	13.00	9.10	8.50	5.50	20.50
23	11.25	9.00	7.10	4.25	17.25	21	11.85	9.10	8.50	5.50	20.50
30	11.25	8.85	7.50	4.25	17.25	28	11.75	8.85	8.50	5.50	20.50
June 6	11.25	8.85	7.50	4.25	17.25	Dec. 5	11.50	9.00	8.25	5.35	20.50
13	11.25	8.85	7.75	4.25	17.60	12	11.25	8.85	8.10	5.35	21.00
20	11.25	8.85	7.25	4.25	11.60	19	11.50	8.85	8.25	5.35	20.50
27	11.25	9.00	7.25	4.50	17.60	26	11.75	9.10	8.25	5.25	20.50
						31	11.75	9.10	8.25	[2]5.25	20.00

[1] Waste Trade Journal, New York, Jan. 16, 1926.

The following monthly average scrap-metal prices at New York in 1925 for new zinc clippings, block-tin pipe, and cast aluminum, in cents per pound, were quoted by the American Metal Market:

Average scrap-metal prices at New York in 1925, in cents per pound[1]

Month	New zinc clippings	Block-tin pipe	Cast aluminum	Month	New zinc clippings	Block-tin pipe	Cast aluminum
January	4.88	51.00	16.50	August	5.12	49.50	16.84
February	4.88	48.66	17.00	September	5.12	49.98	18.19
March	5.04	46.58	16.85	October	5.39	53.36	19.05
April	4.87	44.19	16.00	November	6.01	55.53	19.50
May	4.98	44.28	16.00	December	6.00	53.90	19.50
June	5.20	46.45	16.00				
July	5.12	48.06	16.33	Year	5.20	49.29	17.31

[1] Metal Statistics, 1926.

SECONDARY METALS RECOVERED

The quantity of the metals contained in numerous alloys made partly or wholly from secondary material can not be ascertained definitely. The figures given as the result of the annual canvass are only approximate, but they constitute the sole available data on an important industry.

The increase in the value of the secondary metals, exclusive of gold, silver, platinum, iron, steel, and ferro-alloys, recovered in the United States in 1925 was due in part to the higher average price of all metals and the much larger recoveries of secondary copper, lead, antimony, and aluminum.

The amount of secondary platinum metals recovered in 1925 was 43,274 troy ounces, 79 per cent of that recovered in 1924, and equaled 34 per cent of the platinum metals imported for consumption in the United States during the year.

The value of the gold and silver contained in old jewelry, dental waste, tableware, ornaments, and other articles remelted or refined in 1925 was $36,660,828. Mints and refineries reported the recovery of 9,897,416 fine ounces of silver and $29,792,021 in gold from waste or discarded material. Jewelry and dental waste furnish the largest supplies of secondary gold, and silverware and photographic waste of secondary silver.[4] The recoveries of silver from waste film and from photographic solutions probably amounted to more than 1,000,000 ounces. The consumption of silver in chemical and photographic industries in 1925 is estimated at 7,000,000 ounces and that in the arts and industries in the United States at 31,000,000 ounces.

Most of the silver recovered from photographic waste is obtained from solutions and is recovered by the larger makers of films and plates and by the motion-picture industry. Generally these solutions contain less than half an ounce of silver to the gallon. The recovery from waste film is probably 800 ounces to the million feet.[5]

It is difficult to appraise the value of the ferrous scrap remelted in 1925. Estimates of the quantity range from 9,000,000 to 13,000,000 long tons. It probably was larger in 1925 than in 1924, as the output of steel was greater, and the high price of coke during the latter part of 1925 caused a relatively larger use of scrap. Profits were, however, less than in 1924, for scrap-iron dealers buying speculatively paid higher prices than were found to be warranted by future markets. Estimates can be obtained for scrap iron and steel used at smelting plants, but no data are available for the large quantities of scrap iron used at the thousands of foundries, some of which use as high as 30 to 40 per cent of scrap metal.

A considerable part of the scrap ferrous metal contained nickel, tungsten, manganese, chromium, vanadium, molybdenum, or other alloy metals, which made it much more valuable than the ordinary commercial iron and steel scrap, though the market is limited and some knowledge regarding consumers is necessary in finding prospective purchasers. The railways are, on the whole, the largest producers of most kinds of metal scrap, as well as the largest users of new and remelted metal. It is estimated that the railways usually supply more than 30 per cent of the scrap iron and steel and industrial plants nearly as much. The National Bank of Commerce of New York, in a review of the scrap iron and steel industry, says that there are about 3,000 scrap iron and steel yards in the United States, and that about 5,000,000 tons of ferrous scrap is derived from country and urban collections, mainly from discarded agricultural and household implements and mining, oil, and gas machinery and equipment. This quantity does not include rails, pipe, machinery, and other equipment renovated and sold for the original use, but only such waste as goes to remelters.

---

[4] A recent patent for the recovery of silver from solutions used in photographic work is No. 1527942, Feb. 24, 1925, issued to Louis Weisburg, New York, N. Y.

[5] Byers, C. A., "Recovery of silver from movies' laboratory waste": Eng. and Min. Jour. Press, Aug. 26, 1922, p. 373.

An article by E. J. Lowry, metallurgist, Hickman, Williams & Co., Chicago, Ill., published in the Daily Metal Reporter, October 25, 1924, entitled "How use of scrap promotes conservation of resources," demonstrates the importance of the utilization of waste material in the production of steel, points out the abuses existing in the industry, and suggests remedies for their elimination. Lowry says that the total quantity of iron and steel scrap produced in the United States, taking 10-year averages, is about 24,800,000 tons, and that of this quantity 11,940,000 tons is handled by dealers and brokers and finds its way to market. The remainder stays within the confines of steel mills and furnaces.

It is impracticable and unnecessary to segregate the statistics relating to the melting, refining, and use of secondary metals according to States. Nearly all the secondary aluminum was reported from Ohio, Michigan, Connecticut, Illinois, Iowa, New York, and Missouri. The largest recoveries from tin dross, tin scruff, and clean tin scrap were made in Pennsylvania, New York, New Jersey, California, Indiana, and West Virginia. Nearly all the secondary nickel was reported from Connecticut, New Jersey, and New York. The recoveries of lead, zinc, and copper, and of such alloys as babbitt, bronze, brass, and pewter, were more generally distributed, though the largest secondary smelters and refineries are in Pennsylvania, Illinois, Missouri, Michigan, Ohio, New York, and New Jersey.

The secondary metal recoveries in California have increased considerably during the past two years. The proportion of scrap metals remelted in the Rocky Mountain, southern, and central regions remain comparatively small. The greatest expansion in the supply of waste-metal scrap and also in the smelting of scrap, drosses, etc., has been in the Great Lakes region, particularly at Detroit and Cleveland.

Secondary metals of certain classes recovered in the United States, 1924–25

	1924		1925	
	Short tons	Value	Short tons	Value
Copper, including that in alloys other than brass	196,500	$51,483,000	250,600	$71,170,400
Brass scrap remelted	274,000	58,444,200	242,300	56,270,800
Lead as metal	90,400	32,720,000	112,420	39,477,100
Lead in alloys	114,100		114,460	
Zinc as metal	58,886	9,020,000	61,430	11,359,000
Zinc in alloys other than brass	10,500		13,300	
Tin as metal	7,700	31,062,100	7,950	35,165,400
Tin in alloys and chemical compounds	23,600		23,000	
Antimony as metal	90	2,025,600	1	3,794,000
Antimony in alloys	9,314		10,839	
Aluminum as metal	10,350	14,596,200	17,700	24,816,000
Aluminum in alloys	16,650		26,300	
Nickel as metal	114	1,227,500	191	1,518,000
Nickel in nonferrous alloys and salts	2,126		2,109	
		200,578,600		243,570,700

SECONDARY COPPER

Secondary copper recovered in the United States, 1924–25, and imports and exports of brass and copper scrap, in short tons

	1924	1925
Copper as metal	141,500	183,700
Copper in alloys other than brass	55,000	66,900
	196,500	250,600
Copper from new scrap (not including brass)	36,000	50,000
Copper from old scrap (not including brass)	160,500	200,600
	196,500	250,600
Brass scrap remelted:		
New clean scrap	123,000	110,000
Old scrap	151,000	132,300
	274,000	242,300
Copper content of brass scrap (averaging 70 per cent copper):		
New scrap	86,100	79,200
Old scrap	105,700	90,410
	191,800	169,610
Total secondary copper (including copper content of brass scrap):		
From new scrap	122,100	129,200
From old scrap	266,200	291,010
	388,300	420,210
Brass scrap imported	4,636	5,374
Scrap copper imported	1,855	5,214
Brass scrap exported	29,294	[1] 48,189
Scrap copper exported	2,597	6,053

[1] Includes ingots in 1925; not separately classified.

Of the total quantity of secondary copper recovered in 1925, 99,180 tons (21,771 tons more than in 1924) were recovered by plants refining primary metals and the remainder by plants treating only secondary materials. The copper produced by smelters of secondary material included 84,520 tons of pig copper, 66,900 tons of copper in alloys other than brass, and 169,610 tons of copper in remelted brass. These figures indicate increases of 20,429 tons in pig copper and 11,900 tons in alloys other than brass and a decrease of 22,190 tons in brass.

The value of the copper, both as metal and in alloys, computed at 14.2 cents a pound, the average price for the year of all marketable grades of new metal, amounted to $119,339,640.

The imports of brass scrap into the United States, which in 1922 were 71,962 tons (much greater than in normal years), decreased to 20,395 tons in 1923, to 4,636 tons in 1924, and increased to 5,374 tons in 1925. On the other hand, scrap copper and scrap brass exports increased sharply in 1924 and probably again in 1925, and representatives of foreign smelters actively competed with domestic smelters for large lots of all kinds of scrap metals and alloys, especially scrap brass and tin-bearing alloys. The increase in exports of brass scrap in 1925 is, however, not definitely known, as the records of the Bureau of Foreign and Domestic Commerce show only an aggregate, 48,189 tons, of "ingots, scrap, and old" for 1925, as against 29,294 tons of "scrap and old" in 1924. The exhaustion of supplies of European brass scrap is shown by the small imports to the United

States. These imports have decreased 66,588 tons since 1922. The increased exports and decreased imports account for the decline in the quantity of brass scrap remelted—from 311,000 tons in 1923 to 242,300 tons in 1925.

Railways sell or turn in the larger part of their brass and copper scrap and other metal waste to dealers in part payment for new material, but the reports show that the railways utilized in their own shops and foundries more than 6,000 tons of brass in addition to 1,600 tons of copper and 19,900 tons of copper in alloys other than brass. The railway reports, however, frequently include under "brass" alloys that should more properly be designated "bronze." On the other hand, manganese bronze should be called manganese brass,[6] and scrap metals can be successfully employed in making it.

The names recommended by the American Society for Testing Materials to be used in connection with certain brass, bronze, and nickel alloys of copper are given in the report on secondary metals in Mineral Resources for 1919.

S. Skowronski, metallurgist of the Raritan Copper Co., has said that there is undoubtedly room for considerable increase in the use of scrap in the production of copper alloys. Clean scrap metal is an advantage rather than a detriment in remelting, and it is perfectly good practice to use as much as 90 per cent scrap in the total melting. He has also estimated that nearly 75 per cent of fabricated copper in everyday use eventually returns to be consumed in the form of scrap. Casting copper, which is nearly all made from secondary material, is quoted usually at half a cent to three quarters of a cent a pound under electrolytic copper.[7]

SECONDARY LEAD

Secondary lead recovered in the United States, 1924–25, in short tons

	1924	1925
Secondary lead recovered by smelters that treat mainly ore	31,398	35,146
Secondary lead recovered by smelters that treat only scrap and drosses	59,002	77,274
	90,400	112,420
Secondary lead recovered in remelted alloys:		
Lead content of antimonial lead scrap treated at regular lead smelters	6,630	9,483
Lead content of drosses and scrap alloys treated at secondary smelters	107,470	104,977
	114,100	114,460
Total secondary lead recovered	204,500	226,880

Refined primary lead produced in the United States, 1924–25, in short tons

	1924	1925
From domestic ore	566,407	654,921
From foreign ore and base bullion	124,086	112,048
Lead content of antimonial lead from foreign and domestic ores and bullion treated at regular smelters	18,024	17,043

[6] Livermore, F. A., "Manganese bronze—the use of scrap": Brass World, February, 1923, pp. 43–44.

[7] Bregman, Adolph, "Recovery of scrap copper": Metal Industry, March, 1926, pp. 102–103.

The secondary lead recovered in 1925 amounted to 11 per cent more than in 1924; that recovered as pig lead increased 22,020 tons, that recovered by those smelters whose product is mainly primary metal increased 3,748 tons, and that recovered in alloys increased 360 tons. A considerable part of the lead recovered from alloys was derived from old Babbitt metal, solder, type metal, and white-metal drosses, but the main sources of secondary pig lead are old pipe, lead cable, battery plates, and lead lining of acid tanks. Regular primary smelters reported the recovery of 9,483 tons of lead in scrap antimonial lead, or 2,853 tons more than in 1924. About 2,155 short tons of lead were contained in materials imported under the classification "type metal and antimonial lead" in 1925.

The use of lead in batteries has expanded rapidly with the growth of the automotive and radio industries, and a very large part of the secondary lead now recovered is obtained from old batteries. It is estimated that nearly half of the lead recovered in alloys was from battery plates and mud.

The total output of secondary lead was equal to 30 per cent of the refined primary lead produced in the United States in both 1924 and 1925, and was not exceeded by the output of primary domestic lead in any one State.

SECONDARY ZINC

Secondary zinc recovered in the United States, 1924–25, and products made from zinc dross, skimmings, and ashes, in short tons

	1924	1925
Secondary zinc recovered by redistillation	35,486	39,181
Secondary zinc recovered by sweating, remelting, etc.	23,400	22,249
Total zinc recovered unalloyed	58,886	61,430
Zinc recovered in alloys other than brass	10,500	13,300
Zinc recovered in brass (estimated)	63,000	53,300
Zinc dust made from zinc dross	5,659	5,813
Zinc dross used for zinc dust (estimated)	6,600	6,850
Zinc concentrates and ore exported	10,845	68,951
Zinc dross exported		15,968
Lithopone made from zinc skimmings and ashes	37,564	48,705
Secondary zinc content of lithopone	7,492	9,741
Zinc chloride made from zinc skimmings, ashes, etc.	42,574	45,772
Zinc content of zinc chloride made from zinc skimmings, etc.	9,367	10,070
Zinc content of zinc sulphate made from zinc skimmings, ashes, etc.	858	858

Secondary zinc recovered as pig metal and in alloys (including brass) showed a small decrease in the total quantity in 1925, but more zinc dross was exported than in 1924, and more zinc dust, lithopone, and zinc chloride was made from dross, skimmings, etc. The estimated zinc content of brass remelted in 1925 decreased nearly 10,000 tons from that in 1924.

In addition to the 61,430 tons of remelted and redistilled zinc, 48,705 tons out of a total production of 138,460 tons of lithopone (a zinc pigment containing approximately 20 per cent zinc) was made from zinc skimmings and ashes. It is estimated that the zinc content of skimmings and ashes used for lithopone was 9,741 tons, an increase of 2,249 tons. The quantity of zinc chloride made in 1925 was 48,721 tons, of which 45,772 tons, containing 10,070 tons of zinc,

was made from zinc ashes, skimmings, etc. The secondary zinc recovered in all zinc pigments in 1925, including that in lithopone, was 11,714 tons and that recovered in zinc sulphate was 858 tons.

The exports of zinc dross, which amounted to 5,123 tons in 1919, 2,445 tons in 1920, 510 tons in 1921, 8,412 tons in 1922, and 15,968 tons in 1925, were not separately recorded by the Bureau of Foreign and Domestic Commerce for 1923 and 1924.

Two plants in San Francisco are making zinc dust from zinc dross, so that all that material available on the Pacific coast has a good market. About 6,850 tons of dross was used in the United States in 1925 to make 5,813 tons of zinc dust.

The recovery of secondary zinc (including that in brass) in 1925 was 22 per cent of the output of primary zinc in the United States. This recovery of secondary zinc was 4,356 tons less than in 1924. The American Bureau of Metal Statistics estimates that 286,600 tons of zinc were used in 1925 for zincking sheets, forms, tubes, wire, etc. Only a small part of the zinc used in galvanizing is recovered, though some zinc chloride is made from clippings from galvanized sheets. The zinc content of zinc chloride or zinc sulphate made from galvanized clippings probably exceeded 1,000 tons.

Five smelters—one each in California, New Jersey, New York, West Virginia, and Pennsylvania—treated zinc drosses and skimmings by means of large graphite retorts of 600 to 800 pounds capacity instead of the small clay retorts used by smelters treating ore or mixed ore and drosses. Zinc drosses and skimmings have many uses, and these create active competition for their purchase. Considerable zinc is recovered by sweating, and the residues are then sold for redistillation. The production of zinc from drosses and skimmings made by smelters by redistillation was 3,695 tons more in 1925 than in 1924.

The zinc recovered in alloys other than brass amounted to 13,300 tons, compared with 10,500 tons in 1924. Of the secondary zinc recovered unalloyed, 64 per cent was obtained by redistillation from drosses and skimmings and the remainder by sweating, remelting, etc.

SECONDARY TIN

Secondary tin recovered in the United States, 1924–25

	1924	1925
Tin recovered as pig tin.....short tons	7,700	7,950
Tin recovered in alloys and chemical compounds.....do	23,600	23,000
	31,300	30,950
Clean tin-plate scrap treated at detinning plants.....long tons	166,303	172,432
Old tin-coated containers treated.....do	----------	1,167
Metallic tin recovered at detinning plants.....pounds	2,035,600	1,932,850
Tin content of tin tetrachloride, tin bichloride, tin crystals, and tin oxide made at detinning plants.....pounds	4,032,800	4,264,340
Total tin recovered at detinning plants.....do	6,068,400	6,197,190
Tin tetrachloride, tin bichloride, tin crystals, and tin oxide made at detinning plants.....pounds	8,106,107	8,626,387
Average quantity of tin recovered per long ton of old tin-coated containers.....pounds	----------	25
Average quantity of tin recovered per long ton of clean tin-plate scrap.....do	36.5	35.8

Tin (metal) and tin concentrates (tin content) imported and tin produced from imported concentrates in the United States, 1924–25, in short tons

	1924	1925
Tin imported as metal	72,866	85,843
Tin concentrates (tin content) imported	174	214
Tin produced from foreign concentrates smelted in the United States	486	----------

The United States consumed 52 per cent of the world's primary output of tin in 1925; but in that year no metallic tin from ore or concentrates, either domestic or foreign, was smelted in the United States, though 22.2 short tons of tin concentrates containing 13.8 tons of tin were recovered from placer mines in the Nome and Hot Springs districts, Alaska.

The secondary tin recovered decreased from 31,300 tons, valued at $31,062,100, in 1924, to 30,950 tons, valued at $35,165,400, in 1925, equal to 36 per cent of the tin imported into the United States as pig metal in 1925 (85,843 tons). The value here assigned to the recovered tin is arbitrary and is based on the yearly average price (56.81 cents per pound) for 99 per cent metal, with prompt delivery at New York, given by the American Metal Market. The secondary tin in alloys decreased 600 tons, and the secondary pig tin increased 250 tons.

Clean tin-plate scrap is detinned by the electrolytic alkali process, the chlorine process, or by sweating. Nearly all detinning in the United States is done by the electrolytic process or by the chlorine process. A complete history of the different methods of detinning is given in an article, entitled "Scrap detinning affords big outlet for chlorine," by C. L. Mantell, in Chemical and Metallurgical Engineering, August, 1926, pages 477–479.

The sweating process (removal of the tin coating by raising the scrap to a sufficiently high temperature) and methods other than those above specified have not met with any commercial success; the recovery has been poor and the base metal is left insufficiently cleaned.[8]

The tin reported recovered in alloys and compounds in 1925 included the tin content of products made in several plants from clean tin-plate scrap. The materials recovered included some tin crystals, tin oxide, and putty powder, but consisted mainly of tin tetrachloride and tin bichloride. The production of these compounds is stated together in order to avoid disclosing confidential information. As the products are made from scrap tin, and thus conserve the primary metal, they are properly regarded as recovered tin.

The largest recoveries of tin were made from the scruff and drosses that occur in making tin plate and terneplate; they amounted to about 6,200 short tons. The quantity of tin plate and terneplate made in 1925 (according to the American Iron and Steel Institute) was 1,657,795 long tons, or 239,141 tons more than in 1924.

About 3,100 short tons of tin was recovered from clean scrap tin plate, either as pig tin or as tin chloride, tin crystals, or tin oxide. Apparently only about 500 tons of pig tin was recovered from scrap

[8] Brass World, "Tin recovery from tin-plate scrap": July, 1926.

tin (not tin plate), clippings, old tin pipe, tin foil, and collapsible tubes, and it is impossible to give separately the quantities of tin recovered from these sources. Old block-tin pipe is most acceptable scrap, but the quantity available is small and is steadily declining. A considerable quantity of tin was also recovered from waste tin liquors used in dyeing.

Nearly all the tin-plate scrap imported in 1925 came from Canada. A comparatively small quantity of old tin containers was used to make sash weights by remelting in a cupola. No tin was recovered by this process, and the impure metal recovered is not suitable for ordinary castings, being too brittle.

Formerly a large copper mine used tin-plate scrap from canning factories to recover copper from mine waters, but it now uses baled detinned scrap. This scrap costs about $20 a ton, and 1 pound of it is necessary to precipitate 1 pound of copper.

A large quantity of tin was recovered in bronze, and part of the brass remelted contains a little tin and lead, which in the aggregate amounts to a considerable quantity. Other alloys from which secondary tin was recovered were solder, babbitt, pewter, terne metal, and electrotype metal.

Reports received show that the clean tin-plate scrap detinned in 1925 was 6,129 long tons more than in 1924. The average metallic content of the tin oxide was given as 78 per cent, that of the tin bichloride as 24.5 per cent, tin crystals 52.6 per cent, and tin tetrachloride 45.4 per cent.

The relatively small quantity of secondary tin recovered from tin-plate scrap and old tin-coated cans is significantly shown when compared with the quantity of tin used in making tin plate. It is estimated that about 25,000 short tons of tin were used in the United States in 1925 by makers of tin plate and terneplate, and in excess of 40,000,000 base boxes of tin plate were made. The total recovery of secondary tin as metal and in compounds from tin-plate scrap and old cans in 1925 was 3,114 short tons.

A description of the method used in treating old tin-coated cans is given in Mineral Resources for 1919.

New tin-plate clippings were treated at plants of the Vulcan Detinning Co. at Sewaren, N. J., Neville Island, Pa., and Streator, Ill.; by the Johnson & Jennings Co., of Cleveland, Ohio; and at the plants of the Metal & Thermit Co. at San Francisco, East Chicago, Ind., and Chrome, N. J.

The plants utilizing old tin cans, which can handle 25,000 tons a year, treated only 1,167 long tons in 1925. These plants never received shipments large enough to operate steadily at full capacity, even when the prices of tin and black sheet-metal scrap were high. The present high costs of collecting and stripping old cans hardly warrant even local collections of old cans, and the plants only treated the small quantity given above which came from near-by sources.

Although there is now a supply of tin sufficient for all requirements, there are two good reasons for restricting its use to the lowest point. One is that the supply of new tin is derived almost entirely from foreign sources, and the other is that tin is a relatively high-priced metal, and the use of substitutes giving approximately equal efficiency radically reduces the cost of many alloys, such as solder, babbitt, and other bearing metals.

SECONDARY ANTIMONY

Secondary antimony recovered in, primary antimonial lead produced in, and antimony imported into the United States, 1924–25, in short tons

	1924	1925
Secondary antimony in antimonial-lead scrap smelted at regular smelters	944	1,328
Secondary antimony recovered at secondary smelters	8,460	9,512
	9,404	10,840
Primary antimonial lead produced at regular smelters	20,787	19,667
Antimony content of primary antimonial lead	2,763	2,624
Antimony imported in ore, as metal, or as oxide or salts	9,442	13,182

The production of secondary antimony in the United States in 1925, of which all but 1 ton was recovered in alloys, amounted to 10,840 tons, an increase of 15 per cent over 1924. The value given in the table on page 221 is based on the average yearly price for ordinary brands of antimony at New York as published by the American Metal Market.

The regular smelters reported the recovery of 1,328 tons of antimony, contained in 10,811 tons of antimonial-lead scrap. The recovery from secondary sources was 82 per cent of the imports. The principal materials refined or resmelted that contained antimony as an alloy were hard-lead drosses, Babbitt, battery plates, solder, pewter, and type metal. Antimony used in the rubber, glass, enamel, paint, and ceramic industries does not yield any secondary recoveries, but nearly all the antimony used in battery plates and type metal eventually comes back for remelting and refining. The quantity of antimony used for coloring rubber and for pigments has materially increased, owing to the higher price of quicksilver.

The production of domestic antimony ore in 1925 was 123 short tons, containing 33 tons of metallic antimony. Of the 19,667 tons of antimonial lead produced in 1925, 14,472 tons were produced from domestic ores. The antimony imported in ore, as metal, or as oxide or salts amounted to 13,182 short tons.

The National Lead Co. early in 1925 purchased from the Metallurgical & Chemical Corporation the plant and the Harris process for refining lead. The application of the process is said to remove antimony and other metals and impurities from the lead and to result in the recovery, in a form easily reducible to metal, of 99 per cent of the antimony content. Old battery plates and mud are now bought at a price based on the price of pig lead at St. Louis on the day of purchase, and the antimonial content is ignored in fixing the price, the antimony content being paid for as lead. Antimony sold as high as 24.5 cents a pound in 1925, and the average price for the year was 17.5 cents, or 8.8 cents more than that of lead. Antimony has been separated from antimonial lead, but the practice has not been general, and because of the cost and difficulty of separation the old battery plates are usually remelted and marketed as antimonial lead. The antimony content of antimonial lead varies from as low as 3 per cent to as high as 20 per cent. The average is between 4 and 8 per cent, and a process which cheaply separates metal bought at 6 to 7 cents a pound must result in additional profits, when refined pig lead and antimony can be marketed at the present high prices.

SECONDARY ALUMINUM

Secondary aluminum recovered in the United States, 1924–25, in short tons

	1924	1925
Secondary aluminum recovered unalloyed	10,350	17,700
Aluminum recovered in alloys (mainly No. 12)	16,650	26,300
	27,000	44,000

Primary aluminum produced in the United States and imported and exported, 1924–25

	1924	1925
Value of primary aluminum produced in the United States	$37,607,000	$36,430,000
Aluminum (crude and semicrude) imported for consumption, pounds	31,809,941	41,997,178
Aluminum (crude and semicrude) exported, do	6,343,512	12,642,034
Primary aluminum produced in the United States, short tons	[1] 72,200	[2] 72,000

[1] American Bureau of Metal Statistics. [2] Estimate by Bureau of Mines.

The recovery of secondary aluminum as pig aluminum or in alloys in 1925 amounted to 44,000 short tons, valued at $24,816,000, compared with 27,000 tons, valued at $14,596,200, in 1924.

Some of the larger secondary smelters, refiners, and users of aluminum in 1925 were as follows:

Aluminum Smelting & Alloys Co., Hamden, Conn.
Apex Smelting Co., Chicago, Ill.
Aurora Refining Co., Aurora, Ill.
Cleveland Electro Metals Co., Cleveland, Ohio.
Federated Metals Corporation, New York, N. Y.
Ford Motor Co., Detroit, Mich.
General Metals Refining Co., St. Louis, Mo.
Globe Metal Co., Chicago, Ill.
Charles L. Hilb Smelting & Refining Co., Cincinnati, Ohio.
W. F. Jobbins Co. (Inc.), Aurora, Ill.
Lewin Metals Corporation, St. Louis, Mo.
Maytag Manufacturing Co., Newton, Iowa.
Michigan Smelting & Refining Co., Detroit, Mich.
National Smelting Corporation, Cleveland, Ohio.
Niagara Falls Smelting & Refining Co., Buffalo, N. Y.
Oberdorfer Brass Co., Syracuse, N. Y.
Peninsular Smelting & Refining Co., Detroit, Mich.
United States Aluminum Co., Cleveland, Ohio.
United States Reduction Co., East Chicago, Ind.
Werra Aluminum Foundry Co., Manitowoc, Wis.

Various products are made by smelters and refiners from scrap aluminum.

A large quantity of No. 12 secondary ingots (92 per cent aluminum and about 8 per cent copper) is made by smelters from old or defective castings, borings, and scrap, as is shown by the fact that the secondary recovery of aluminum in alloys was 60 per cent of the total recovery in 1925. The expanded output of the automotive industry, which is estimated to consume more than 25 per cent of the aluminum production, is reflected in the increased consumption of secondary No. 12 alloy. The recovery of aluminum in alloys in

1925 was 58 per cent more than that reported in 1924. The recent articles relating to aluminum are as follows:

Anderson, Robert J., Smelting secondary aluminum scrap: Metal Industry, January, 1925, page 10; September, 1925, pages 368–370; February, 1926, pages 63–65; May, 1926, pages 187–189.

Knerr, Horace, Aluminum alloy castings from sheet scrap: Metal Industry, December, 1924, pages 481–482.

Meritorious aluminum alloys: Brass World, March, 1925, pages 105–106.

The following articles on aluminum were published in the report for 1919 on secondary metals:

Casting losses in aluminum foundry practice in the United States, by Robert J. Anderson.

Scrap aluminum, by Charles Vickers.

Tentative specifications for aluminum, presented to the American Society for Testing Materials.

In a book recently published (June, 1926), Metallurgy of Aluminum Alloys, by Robert J. Anderson, chapter 10 discusses the character of aluminiferous scrap, and the sampling and assay of drosses and borings, the fluxes used in smelting secondary aluminum, practice in smelting aluminum scrap, and impurities in secondary pig aluminum.

SECONDARY NICKEL

Secondary nickel recovered in the United States, 1924–25, in short tons

	1924	1925
Nickel recovered as metal	114	191
Nickel recovered in nonferrous alloys and salts	2,126	2,109
	2,240	2,300

Primary nickel produced in the United States and imported and exported, 1924–25, in short tons

	1924	1925
Nickel produced as a by-product from the electrolytic refining of copper at domestic refineries	191	272
Nickel imported for consumption in the United States as nickel or in nickel ores and matte, oxide, and alloys	18,459	21,536
Nickel, Monel metal, and other alloys exported	958	1,285

The nickel reported as recovered from secondary sources includes nickel in Monel metal but not that in ferrous alloys, and, as nickel is largely used as an alloy in steel and to some extent in iron, it is evident that 2,300 tons of nickel recovered in 1925 forms probably not more than half that recovered and reused. The secondary nickel recovered from nonferrous sources in 1925 was equal to 11 per cent of the imports.

The secondary nickel reported in 1925 was mainly recovered as Monel metal, old anodes, nichrome, and nickel silver. The alloy nichrome contains about 60 per cent nickel; the remainder is mainly chromium. Extracts from an article in the Brass World giving the properties and uses of this alloy, which is used in heat treatment of steel, are printed in the report on secondary metals in 1919.

The use of nickel in brass foundries is becoming more general. The beneficial use for many purposes of nickel in such alloys is set forth in an article published in the Brass World, June, 1926, pages 201–202.

Analyses of various nickel alloys were published in Mineral Resources, 1915.[9]

The International Nickel Co., desiring to assist users of Monel metal to dispose of scrap and at the same time to protect the purity of the primary metal, has established a definite procedure in the purchase of Monel scrap. The company's publication Inco contains the following information:

The mining and smelting operations are located at Copper Cliff, Ontario; the refining and rolling operations are located at Port Colborne, Ontario, and Huntington, W. Va. Monel-metal scrap must enter operations at one of these points. This is decided to a large extent by the purity of the scrap.

Monel metal as produced is held to a close chemical specification. It contains approximately 67 per cent of nickel, 28 per cent of copper, and 5 per cent of other elements. It has in it no lead and no zinc.

If the user has not allowed other materials to become mixed with his scrap, it should meet production specification. However, it is not entirely possible to prevent all contamination, and in the purchase of scrap the International Nickel Co. allows a certain tolerance. Therefore, scrap within the analysis given below will be purchased at a flat price, which will be quoted on receipt of detailed description of the scrap offered from time to time by the consumer.

Nickel, not less than 64 per cent; copper, not less than 27 per cent; iron, not more than 3½ per cent; sulphur, not more than 0.05 per cent; lead, none; zinc, none.

Provided such scrap does not come within the above analysis, settlement will be made on a basis of copper-nickel content, the price of which will be quoted after sampling and analysis by the International Nickel Co. All scrap will be purchased and settled for on a basis of weight, sample, and analysis.

The cost of sampling and analyzing a shipment of scrap is approximately $35. It is therefore necessary to avoid handling small shipments of scrap if possible, and all consumers are requested to collect their scrap until they have at least 500 pounds before offering it for sale.

---

[9] Hess, F. L., Nickel: Mineral Resources of the United States, 1915, pt. 1, 1917, pp. 763–765.

GOLD AND SILVER IN SOUTH DAKOTA

(MINE REPORT)

By Charles W. Henderson

PRODUCTION

The producing gold and silver mines in South Dakota in 1925 were three lode mines, as compared with four lode mines in 1924. There was no production from placer mines in 1923, 1924, or 1925. The amalgamation and cyanidation mills of the State in 1925 treated 1,589,711 tons of ore, which yielded as bullion $5,961,635 in gold and 81,817 ounces of silver, valued at $56,781—an average recovery of $3.750 in gold and 0.0515 ounce of silver, as compared with $3.653 in gold and 0.0517 ounce of silver in 1924.

Mine production of gold and silver in South Dakota, 1924–25

Year	Number of producing mines	Ore (short tons)	Gold		Silver		Total value
			Fine ounces	Value	Fine ounces	Value	
1924	4	1,674,720	295,930.24	$6,117,421	86,548	$57,987	$6,175,408
1925	3	1,590,079	289,747.10	5,989,604	96,133	66,716	6,056,320
Increase or decrease from 1924	−1	−84,641	−6,183.14	−127,817	+9,585	+8,729	−119,088

Gold and silver bullion produced at mills in South Dakota in 1925

Process	Ore treated	Gold in bullion	Silver in bullion	Quicksilver used	Sodium cyanide used [1]
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*
Amalgamation	1,589,711	195,865.49	49,812	7,500	
Cyanidation	[2] 1,567,555	92,528.61	32,005		347,242
		288,394.10	81,817	7,500	347,242

[1] The materials actually used were 692,515 pounds of cyanamid and 984 pounds of sodium cyanide, in all equivalent to 347,242 pounds of 96 to 98 per cent NaCN.

[2] Sands and slimes from 1,589,701 tons of ore originally treated by amalgamation.

Mine production of gold and silver in South Dakota, 1914–1925 [1]

Year	Gold	Silver		Total value (commercial)
		Fine ounces	Commercial value	
1914	$7,333,508	176,642	$97,683	$7,431,191
1915	7,406,305	199,864	101,331	7,507,636
1916	7,460,644	215,205	141,605	7,602,249
1917	7,364,233	186,765	153,894	7,518,127
1918	6,565,337	159,202	159,202	6,724,539
1919	4,863,040	116,493	130,472	4,993,512
1920	4,676,470	90,795	98,966	4,775,436
1921	6,605,167	112,464	112,464	6,717,631
1922	6,517,788	118,760	118,760	6,636,548
1923	6,406,306	95,844	78,592	6,484,898
1924	6,117,421	86,548	57,987	6,175,408
1925	5,989,604	96,133	66,716	6,056,320

[1] For yearly output to 1913 and authority for each year see Mineral Resources, 1913, pt. 1, p. 42, 1914.

MINING INDUSTRY

At the Homestake mine, from which most of the production of South Dakota has come since 1875, production was continuous during 1925. Other operations of a minor character are noted in the review by counties.

REVIEW BY COUNTIES

CUSTER COUNTY

There was no output of gold reported by any of the mines in Custer County in 1925, and no work was done other than assessment work.

LAWRENCE COUNTY [1]

Mine production of gold, silver, copper, and lead in Lawrence County, S. Dak., 1916–1925

Year	Number of mines producing	Ore	Gold [a]	Silver [a]	Copper	Lead	Total value
		Short tons		*Fine ounces*	*Pounds*	*Pounds*	
1916	29	1,870,572	$7,455,136	215,127	----------	35,406	$7,599,127
1917	24	1,868,143	7,360,266	186,436	736	60,905	7,519,328
1918	13	1,781,661	6,564,850	158,108	2,996	11,536	6,724,517
1919	5	1,329,928	4,863,013	116,010	----------	6,585	4,993,293
1920	7	1,356,189	4,676,470	90,795	----------	12,812	4,776,461
1921	3	1,725,685	6,603,318	112,457	----------	4,000	6,715,955
1922	4	1,751,414	6,515,969	118,753	----------	----------	6,634,722
1923	4	1,665,437	6,406,206	95,844	----------	----------	6,484,798
1924	1	1,670,300	6,091,100	86,354	----------	----------	6,148,957
1925	2	1,590,069	5,988,570	96,133	----------	----------	6,055,286

[a] Includes both placer and lode mine production.

[1] For information on the geology of this county see Irving, J. D., "Ore Deposits of the Northern Black Hills"; chapter in Contributions to Economic Geology: U. S. Geol. Survey Bull. 225, 1904, pp. 123–140; Irving, J. D., and Emmons, S. F., Economic Resources of the Northern Black Hills: U. S. Geol. Survey Prof. Paper 26, 1904, pp. 53–212.

The total value of the product of the Homestake Mining Co. from 1875 to 1925 is $200,544,759.34, and the amount paid in dividends is $48,826,924.29.

Ore milled, receipts, and dividends, Homestake mine, 1916–1925

Year	Ore milled	Receipts for bullion product		Dividends
		Total	Per ton	
	Short tons			
1916	1,600,220	$6,531,003.34	$4.0813	$2,210,208
1917	1,677,623	6,619,573.94	3.9458	1,959,048
1918	1,628,630	5,916,890.31	3.6330	1,506,960
1919	1,192,588	4,346,115.79	3.6443	1,130,220
1920	1,274,944	4,410,193.73	3.4591	
1921	1,620,588	6,299,780.38	3.8873	502,320
1922	1,663,485	6,285,317.56	3.7784	879,060
1923	1,652,337	6,400,078.42	3.8733	1,506,960
1924	1,670,300	6,126,349.99	3.6678	1,756,120
1925	1,589,701	5,999,073.50	3.7737	1,758,120

The annual report of the superintendent of the Homestake Mining Co.[2] for the year ended December 31, 1925, says:

Operations at the mine and mills were continuous and satisfactory throughout the year just passed. Progress is being made in the removal of the machine shops and foundry to the new location between the Ellison hoist and south mill. B. & M. No. 2 shaft has been completed to within 35 feet of the 800-foot level.

The engineers report as follows: Development drifts driven, 9,765 feet; development raises driven, 3,105 feet. There are 639,982 tons of ore broken and remaining in the stopes; there are 15,448,319 tons of ore blocked out and remaining in the mine; the coal mine has furnished all of our coal requirements since April 1, 1925.

The Homestake mine is developed by four vertical shafts from 800 to 2,370 feet deep and by 62 miles of tunnels, drifts, and crosscuts. The amalgamating and cyaniding mills at Lead, Terraville, Blacktail, and Deadwood have a total capacity of 4,600 tons a day; they consist of five primary mills—the Amicus, Pocahontas, Monroe, South, and Terraville—and four secondary mills, including a regrinding mill, two cyanide sand plants, and one slime plant. The crushing equipment includes 500 stamps weighing 950 pounds each and 120 stamps weighing 1,550 pounds each, 6 Allis-Chalmers rod mills, 7 Allis-Chalmers tube mills, and 1 Hardinge ball mill. There are 24 leaching tanks and 43 thickening tanks.

In an article on the mining methods of the Homestake mine Ross and Wayland [3] state that the average tenor of ore as hoisted is $4 a ton, mainly in gold, but containing also a small quantity of silver.

At the Cutting Mining Co.'s property, 2 miles west of Central City, a small quantity of ore was milled as an experiment, and some crude

[2] For description of geology see Paige, Sidney, "The geology of the Homestake mine": Econ. Geology, vol. 18, 1923, pp. 205–237; Geology of the Region Around Lead, S. Dak., and Its Bearing on the Homestake Ore Body: Bull. 765, U. S. Geol. Survey, 1924; Central Black Hills, S. Dak.: U. S. Geol. Survey Geol. Atlas, Folio 219, 1925. Hosted, J. O., and Wright, L. B., "Geology of the Homestake ore bodies and the Lead area, South Dakota": Eng. and Min. Jour.-Press, vol. 115, May 5, 1923, pp. 793–799; May 12, 1923, pp. 836–843.

[3] Ross, A. J. M., and Wayland, R. G., "Mining methods at the Homestake": Mining and Metallurgy, vol. 7, No. 229, January, 1926, p. 21.

ore and concentrates were shipped to Omaha. Milling started early in 1925 and continued until July, but mining continued until October. The concentrates shipped contained about 11 ounces of silver to 1 ounce of gold. The Trojan Mining Co.'s property was idle in 1925.

PENNINGTON COUNTY

Redfern district.—The Doctor Lode No. 2 mine, near Hill City, was being developed by trenches and shallow shafts. There is a 1,000-pound stamp mill and Nelson concentrator on the property, from which some bullion was recovered in 1925. Development work only was done at the Maid of the Hills mine, and assessment work at the Halcyon mines and the Juniper group.

GOLD, SILVER, AND COPPER IN WYOMING

(MINE REPORT)

By Charles W. Henderson

PRODUCTION

No ore was shipped in either 1924 or 1925 from lode mines in Wyoming. Some development work was done on gravels in Albany County. Mine production of gold, silver, and copper in Wyoming from 1914 to 1923 is given in the table below.

Mine production of gold, silver, and copper in Wyoming, 1914–1923 [1]

Year	Ore (short tons)	Gold	Silver		Copper		Total value
			Fine ounces	Commercial value	Pounds	Value	
1914	423	$5,006	116	$64	17,421	$2,317	$7,387
1915	4,216	14,592	840	426	447,246	78,268	93,286
1916	8,876	20,566	5,524	3,635	2,610,622	642,213	666,414
1917	6,335	3,762	3,415	2,814	2,027,857	553,605	560,181
1918	2,870	871	965	965	852,777	210,636	212,472
1919	798	84	151	169	139,900	26,021	26,274
1920							
1921	50	62	111	111	10,000	1,290	1,463
1922	24	1,207	57	57	4,296	580	1,844
1923	584	296	254	208	111,280	16,358	16,862

[1] For yearly output, 1842–1914, see Mineral Resources, 1914, pt. 1, pp. 248–249, 1916.

REVIEW BY COUNTIES

Albany County.—Sluicing operations at the head of Moore's Gulch, near Holmes, for 60 days in 1925 are reported by the owner to have uncovered placer and lode deposits. About 200 feet of development work was done at the property of the Cliff Gold Mining Co., near Centennial. Some development work was done at the Electrolytic (Rambler) mine, at Holmes, but litigation prevented any operation of the dump or reopening of the caved ground.

Platte County.—The Sunrise iron mine was continuously active, but no copper ore, such as that shipped intermittently from 1882 to 1923, was shipped from this mine in 1925.

GOLD, SILVER, COPPER, LEAD, AND ZINC IN NEW MEXICO[1]

(MINE REPORT)

By Chas. W. Henderson

PRODUCTION

The total calculated gross value of the gold, silver, copper, lead, and zinc from ore and gravel produced in New Mexico in 1925 was 11 per cent more than the value of that produced in 1924. In 1925 there were 104 producing mines, of which 92 were lode and 12 were placers—an increase of 6 lode mines and 2 placers.

Mine production of gold, silver, copper, lead, and zinc in New Mexico, 1924–25.

Year	Ore	Gold [1]	Silver [1]	Copper	Lead	Zinc	Total value
	Short tons		*Fine ozs.*	*Pounds*	*Pounds*	*Pounds*	
1924	3,040,652	$512,735	795,070	74,691,436	3,634,511	20,759,200	$12,470,119
1925	3,358,566	549,073	735,124	76,427,825	6,420,060	18,492,300	13,875,960
Increase or decrease from 1924	+317,914	+36,338	−59,946	+1,736,389	+2,785,549	−2,266,900	+1,405,841

[1] Includes placer production, as follows: 1924, $3,639 in gold and 27 ounces of silver; 1925, $2,018 in gold and 13 ounces of silver.

ORE

The quantity of ore sold or treated in 1925 in New Mexico was 3,358,566 tons, an increase of 10 per cent from 1924. Copper ore amounted to 3,172,291 tons, zinc ore 97,726 tons, dry gold and silver ore 52,746 tons, lead ore 17,239 tons, lead-zinc ore 12,121 tons, dry silver ore 3,884 tons, dry gold ore 2,232 tons, and copper-lead ore 327 tons. Amalgamation of 2,210 tons of dry gold ore and table concentration of 52,118 tons of dry gold and silver ore, followed by cyanidation of all but a few cars of extremely high-grade concentrates, yielded an average in bullion and concentrates of 0.193 ounce of gold and 8.286 ounces of silver to the ton.

GOLD

The mine production of gold in New Mexico in 1925 amounted to 26,561.40 fine ounces, valued at $549,073. Hidalgo County produced 40.6 per cent of the total, Catron 29.7 per cent, Grant 18 per cent, Colfax 9.6 per cent, and Santa Fe 1.1 per cent. Dry and siliceous ore yielded 39.9 per cent.

[1] For reports on geology and descriptionsof mines see Lindgren, Waldemar, Graton, L. C., and Gordon, C. H., The Ore Deposits of New Mexico: U. S. Geol. Survey Prof. Paper 68, 1910; also, Finlay, J. R., Report of Appraisal of Mining Properties of New Mexico to Tax Commissioners, Santa Fe, N. Mex., 1921–22. Comparative statistics for the years 1904 to 1922 were published in Mineral Resources for 1922.

SILVER

The mine production of silver in New Mexico in 1925 amounted to 735,124 fine ounces, valued at $510,176, compared with 795,070 fine ounces, valued at $532,697, in 1924. Catron County produced 61.2 per cent of the total, all from the siliceous ore of the Mogollon district; Hidalgo County 18.6 per cent, chiefly from the copper ores of the Lordsburg district; Grant County 10.9 per cent, chiefly from the Central district; Socorro County 3.4 per cent, from the Magdalena district; and Sierra County 3.1 per cent, chiefly from the Lake Valley district. Placer mines yielded 13 ounces of silver.

Dry and siliceous ore yielded 64.9 per cent, chiefly from Catron and Sierra Counties; copper ore 22.2 per cent, chiefly from Hidalgo and Grant Counties; and lead ore 11.6 per cent, chiefly from Grant, Socorro, and Hidalgo Counties.

COPPER

The mine production of copper in New Mexico in 1925 amounted to 76,427,825 pounds, valued at $10,852,751. Of this total 99.2 per cent was produced in Grant and Hidalgo Counties, chiefly from the operations of the Chino Copper Co. in the Central district and from the Eighty-Five mine, in the Lordsburg district. Copper ore yielded 99.6 per cent of the total.

LEAD

The mine production of lead in New Mexico in 1925 amounted to 6,420,060 pounds, valued at $558,545. The chief lead-producing districts were the Magdalena, Socorro County; the Central, Grant County; Steins district, Hidalgo County; and Cooks Peak, Luna County. Lead ore yielded 79 per cent of the output and lead-zinc ore 17 per cent.

ZINC

The mine production of zinc in New Mexico in 1925 amounted to 18,492,300 pounds, valued at $1,405,415. The chief zinc-producing districts were the Central (Hanover), in Grant County, and the Magdalena (Kelly), in Socorro County.

OUTPUT OF ORE AND RECOVERED METAL CONTENT

Ore and metals produced in New Mexico in 1925, by sources

Source	Ore	Gold	Silver	Copper	Lead	Zinc
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*
Dry gold ore	2,232	2,611.87	512	600		
Dry gold and silver ore	52,746	7,982.19	452,310	20,850	2,870	
Dry silver ore	3,884	4.20	24,082	41,490	2,280	
	58,862	10,598.26	476,904	62,940	5,150	
Copper ore	3,172,291	15,636.14	163,561	76,101,442	90,130	
Copper-lead ore	327	1.79	2,210	41,500	116,600	
Lead ore	17,239	156.89	84,976	219,173	5,090,580	
Lead-zinc ore	12,121	70.70	7,331	2,770	1,079,600	3,159,300
Zinc ore	97,726		129		38,000	15,333,000
	3,299,704	15,865.52	258,207	76,364,885	6,414,910	18,492,300
Total lode mines	3,358,566	26,463.78	735,111	76,427,825	6,420,060	18,492,300
Total placers		97.62	13			
	3,358,566	26,561.40	735,124	76,427,825	6,420,060	18,492,300

Ore sold or treated in New Mexico in 1925, by counties, with content in terms of recovered metals

DRY AND SILICEOUS GOLD AND SILVER ORES

County	Ore	Gold	Silver	Copper	Lead	Zinc
GOLD ORE	*Short tons*	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*
Colfax	2,000	2,500.40	426			
Grant	110	33.33	23			
Lincoln	100	46.64	4			
Santa Fe		19.80	4			
Sierra	22	11.70	55	600		
	2,232	2,611.87	512	600		
GOLD AND SILVER ORE						
Catron	52,118	7,900.70	449,699			
Grant	37	7.69	207			
Hidalgo	591	73.80	2,404	20,850	2,870	
	52,746	7,982.19	452,310	20,850	2,870	
SILVER ORE						
Dona Ana	5		728		400	
Grant	35	1.78	1,229	430	1,650	
Hidalgo	1,500	2.32	1,322	41,000		
Sierra	2,344	.10	20,803	60	230	
	3,884	4.20	24,082	41,490	2,280	
	58,862	10,598.26	476,904	62,940	5,150	
COPPER ORE						
Grant	3,061,361	4,689.06	34,823	70,495,772	85,500	
Guadalupe	3,278			330,000		
Hidalgo	105,974	10,672.71	122,668	5,006,570	4,630	
Lincoln	30		137	2,500		
Otero	217	34.59	75	13,300		
Santa Fe	984	166.90	2,939	197,000		
Sierra	49	72.88	1,369	5,500		
Socorro	368		1,523	47,500		
Valencia	30		27	3,300		
	3,172,291	15,636.14	163,561	76,101,442	90,130	
COPPER-LEAD ORE						
Grant	327	1.79	2,210	41,500	116,600	
LEAD ORE						
Dona Ana	216		1,956	1,313	55,000	
Grant	8,284	19.82	41,821	170,100	2,282,360	
Hidalgo	1,305	30.23	10,174	7,720	460,700	
Luna	2,266	47.41	6,603	2,500	525,620	
Otero	293		29	1,600	82,000	
Sierra	130	3.60	863	140	38,700	
Socorro	4,745	55.83	23,530	35,800	1,646,200	
	17,239	156.89	84,976	219,173	5,090,580	
LEAD-ZINC ORE						
Luna	347				69,400	112,300
Santa Fe	5,000	70.70	7,331	2,770	249,800	170,000
Socorro	6,774				760,400	2,877,000
	12,121	70.70	7,331	2,770	1,079,600	3,159,300

Ore sold or treated in New Mexico in 1925, by counties, with content in terms of recovered metals—Continued

ZINC ORE

County	Ore	Silver	Lead	Zinc
	Short tons	*Fine ounces*	*Pounds*	*Pounds*
Grant	97,202			15,033,000
Luna	13			7,000
Socorro	511	129	38,000	293,000
	97,726	129	38,000	15,333,000

PLACER OUTPUT

Placer output of gold and silver in New Mexico in 1925, by counties

County	Gold		Silver		Total value
	Fine ounces	Value	Fine ounces	Value	
Colfax	46.92	$970	6	$4	$974
Grant	25.59	529	6	4	533
Santa Fe	25.11	519	1	1	520
	97.62	2,018	13	9	2,027
Total, 1924	176.04	3,639	27	18	3,657
Decrease from 1924	78.42	1,621	14	9	1,630

SMELTERS

The only smelting plant in the State—the zinc oxide plant at Waldo, near Cerrillos—was idle in 1925. Ore from New Mexico was sent to the lead and copper plants of the El Paso Smelting Works at El Paso, Tex.; the Copper Queen copper smelter and the Calumet & Arizona copper smelter at Douglas, Ariz.; the Ozark zinc-lead oxide plant of Coffeyville, Kans.; and the zinc oxide plant of the Empire Zinc Co. at Canon City, Colo. Small shipments of zinc ore were made to Mineral Point, Wis., and of lead ore to the smelter of Eagle-Picher Lead Co. at Galena, Kans.

MINING INDUSTRY

The chief features of metal production in New Mexico in 1925 were an increase of 339,390 tons in copper ore sold or treated, a 50 per cent increase in the quantity of lead-zinc ore shipped, and an increase of more than 100 per cent in tonnage of lead ore shipped. There were decreases of 15 per cent in the shipments of zinc ore and concentrates from the Hanover and Magdalena districts. The Lordsburg district showed an increased yield of all metals, but the production of gold and silver in the Mogollon district was valued at $169,670 less in 1925 than in 1924, or a decrease of more than 25 per cent. The decrease ($67,638) in the gold output of the Mogollon district in 1925 did not result in a decrease in the total gold output in the State, for the gold from the Elizabethtown district increased $50,113 and that from the Central district $26,178. As the Mogollon mine was closed at the end of 1925, it is probable that the gold and silver output of New Mexico will be much less in 1926 than in 1925.

Mine production of gold, silver, copper, lead, and zinc in New Mexico in 1925, by counties

County	Producing mines	Ore sold or treated (short tons)	Metal content [1]			
			Gold [2]		Silver [2]	
			Fine ounces	Value	Fine ounces	Value
Catron	3	52,118	7,900.70	$163,322	449,699	$312,091
Colfax	9	2,000	2,547.32	52,658	432	300
Dona Ana	2	221			2,684	1,863
Grant	30	3,167,356	4,779.06	98,792	80,319	55,741
Guadalupe	1	3,278				
Hidalgo	18	109,370	10,779.06	222,823	136,568	94,778
Lincoln	3	130	46.64	964	141	98
Luna	11	2,626	47.41	980	6,603	4,582
Otero	2	510	34.59	715	104	72
Santa Fe	6	5,984	282.51	5,840	10,275	7,131
Sierra	7	2,545	88.28	1,825	23,090	16,025
Socorro	11	12,398	55.83	1,154	25,182	17,476
Valencia	1	30			27	19
Total, 1924	104	3,358,566	26,561.40	549,073	735,124	510,176
	96	3,040,652	24,803.56	512,735	795,070	532,697
Increase or decrease from 1924	+8	+317,914	+1,757.84	+36,338	−59,946	−22,521

County	Metal content [1]						Total value
	Copper		Lead		Zinc		
	Pounds	Value	Pounds	Value	Pounds	Value	
Catron							$475,413
Colfax							52,958
Dona Ana	1,313	$186	55,400	$4,819			6,868
Grant	70,707,802	10,040,508	2,486,110	216,292	15,033,000	$1,142,508	11,553,841
Guadalupe	330,000	46,860					46,860
Hidalgo	5,076,140	720,812	468,200	40,733			1,079,146
Lincoln	2,500	355					1,417
Luna	2,500	355	595,020	51,767	119,300	9,067	66,751
Otero	14,900	2,116	82,000	7,134			10,037
Santa Fe	199,770	28,367	249,800	21,733	170,000	12,920	75,991
Sierra	6,300	895	38,930	3,387			22,132
Socorro	83,300	11,829	2,444,600	212,680	3,170,000	240,920	484,059
Valencia	3,300	468					487
Total, 1924	76,427,825	10,852,751	6,420,060	558,545	18,492,300	1,405,415	13,875,960
	74,691,436	9,784,578	3,634,511	290,761	20,759,200	1,349,348	12,470,119
Increase or decrease from 1924	+1,736,389	+1,068,173	+2,785,549	+267,784	−2,266,900	+56,067	+1,405,841

[1] In terms of metal recovered; figures are derived from individual mine reports, with allowances made for smelting recoveries and losses.

[2] Includes placer production, as follows: 1924, $3,639 in gold and 27 ounces of silver; 1925, $2,018 in gold and 13 ounces of silver.

Gold and silver contained in bullion produced at mills in New Mexico in 1925

Process	Ore	Gold	Silver	Quicksilver used	Sodium cyanide used
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*
Amalgamation	2,210	2,600.17	457	100	
Cyanidation	52,118	7,632.98	438,732		[1] 81,159
	54,328	10,233.15	439,189	100	81,159

[1] In terms of 96 to 98 per cent strength.

Mine production of metals from gold and silver mills in New Mexico in 1925, by counties

County	Ore to gold and silver mills	Recovered in bullion		Concentrates and recovered content		
		Gold	Silver	Concentrates produced	Gold	Silver
	Short tons	*Fine ounces*	*Fine ounces*	*Short tons*	*Fine ounces*	*Fine ounces*
Catron	52,118	7,632.98	438,732	20	267.72	10,967
Colfax	2,000	2,500.40	426			
Grant	110	33.33	23			
Lincoln	100	46.64	4			
Santa Fe		19.80	4			
	54,328	10,233.15	439,189	20	267.72	10,967

NOTE.—Average recovery per ton in bullion and concentrates: Gold, 0.193 ounce; silver, 8.286 ounces.

Mine production of metals from concentrating mills in New Mexico in 1925, by counties

County	Ore to concentrating mills	Concentrates and recovered content					
		Concentrates produced	Gold	Silver	Copper	Lead	Zinc
	Short tons	*Short tons*	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*
Grant	3,099,839	166,125	4,445.11	14,624	66,973,638		15,000,000
Hidalgo	1,500	301	2.32	1,322	41,000		
Santa Fe	5,000	837	70.70	7,331	2,770	249,800	170,000
	3,106,339	167,263	4,518.13	23,277	67,017,408	249,800	15,170,000

Mine production of metals from New Mexico concentrates, 1924–25

Year	Concentrates	Gold	Silver	Copper	Lead	Zinc
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*
1924	164,009	4,385.29	65,462	66,776,506		16,322,000
1925	167,283	4,785.85	34,244	67,017,408	249,800	15,170,000

Mine production of metals from New Mexico crude ore shipped to smelters in 1925, by counties

County	Ore	Gold	Silver	Copper	Lead	Zinc
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*
Dona Ana	221		2,684	1,313	55,400	
Grant	67,407	275.03	65,666	3,734,164	2,486,110	33,000
Guadalupe	3,278			330,000		
Hidalgo	107,870	10,776.74	135,246	5,035,140	468,200	
Lincoln	30		137	2,500		
Luna	2,626	47.41	6,603	2,500	595,020	119,300
Otero	510	34.59	104	14,900	82,000	
Santa Fe	984	166.90	2,939	197,000		
Sierra	2,545	88.28	23,090	6,300	38,930	
Socorro	12,398	55.83	25,182	83,300	2,444,600	3,170,000
Valencia	30		27	3,300		
	197,899	11,444.78	261,678	9,410,417	6,170,260	3,322,300

REVIEW BY COUNTIES AND DISTRICTS

CATRON COUNTY

Mogollon district.—The Mogollon Mines Co.'s Last Chance 40-stamp, 150-ton cyanidation and concentration mill ran until April 1, 1925, on ore from its Last Chance-Top group and from the Confidence-Dutch Boy group (under option). The Mogollon Mines Co. also worked the American Silver Corporation group (known as the Fanney), and also the Alberta group and Johnson mine, from which ore was mined and milled at the Fanney 200-ton cyanidation mill. The Fanney mill was shut down in January, 1926.

Mine production of gold and silver in Mogollon or Cooney district, Catron County, N. Mex., 1924–25

Year	Ore	Gold	Silver	Total value
	Short tons		*Fine ounces*	
1924	72,736	$230,960	618,094	$645,083
1925	52,118	163,322	449,699	475,413
Decrease from 1924	20,618	67,638	168,395	169,670

COLFAX COUNTY

Baldy district (*Elizabethtown, Therma, Baldy*).—The Rosita Gold Mining Co., a lessee, worked the Aztec mine and had its Lane slow-speed amalgamation mill running on ore from pillars and stope filling to the end of 1925, when operation of the mine was undertaken by the owners, the Maxwell Land Grant Co. The Lowrey and Big Nigger placers at Elizabethtown, the Kaiser on Willow Creek, the Collamer on Ute Creek, and the North Ponil placer on North Ponil Creek were worked by sluicing.

Some development work was done on the Black Horse property, near Baldy, and on the Red Bandana property, near Elizabethtown, from which a small quantity of specimen gold was recovered.

Mine production of gold and silver in Elizabethtown district, Colfax County, N. Mex., 1924–25

Year	Ore	Gold		Silver [1]	Total value
		Placer	Lode		
	Short tons			*Fine ounces*	
1924		$2,303	$242	15	$2,555
1925	2,000	970	51,688	432	52,958
Increase or decrease from 1924	+2,000	−1,333	+51,446	+417	+50,403

[1] Includes placer production.

DONA ANA COUNTY

About six cars of lead ore and a few tons of siliceous silver ore were shipped in 1925 from the Little Buck and Stephenson-Bennett mines, in the Organ Mountains district. This ore yielded 2,684 ounces of silver, 1,313 pounds of copper, and 55,400 pounds of lead. Most of the ore shipped from the Stephenson-Bennett group was taken from old levels, but a little was sorted from old dumps.

GRANT COUNTY[2]

Burro Mountain district.—At the Burro Mountain branch of the Phelps Dodge Corporation, at Tyrone, most of the output of copper was obtained from leaching old dumps, though a considerable quantity of copper was recovered from copper oxidized ores mined and shipped by lessees to smelters. The 2,000-ton concentration plant for the copper sulphide ores remained idle all the year.

Central district.—The Empire Zinc Co.'s 250-ton magnetic-separation mill at Hanover ran steadily, and the product, a high-grade zinc sulphide concentrate, went to the company's zinc oxide plant at Canon City, Colo. Copper ore was shipped from the Hanover-Bessemer group, Dewey & Schley, Groundhog, Philadelphia group, Mary, San Jose, and Lucky Bill mines. Lead ore was shipped from the Forgotten, Groundhog, Lucky Bill, and some small mines. Copper-lead ore was also shipped from the San Jose group of mines. Lead ore shipped to smelters in 1925 amounted to 7,835 tons. Copper ore concentrated amounted to 3,002,700 tons, and the crude copper ore shipped to smelters amounted to 51,103 tons. Operation of five sections and the regrinding part of a sixth section of the Hurley mill of the Chino mines of the Ray Consolidated Copper Co. was continuous in 1925, and the output of direct smelting ore was larger than in 1924. The general manager of the Chino mines, in his report dated March 31, 1926, in the seventeenth annual report of the Ray Consolidated Copper Co. for the year ended December 31, 1925, says:

> There were no changes in the holdings that affected the acreage held at Santa Rita and Hurley. The area held for mining operations at Santa Rita is 3,625 acres. In addition there are 120 acres of agricultural land adjacent to this group of mining holdings. In connection with its milling operations at Hurley, water rights and tailings disposal, there are owned 19,891 acres of nonmineral land. The holdings, therefore, at Santa Rita and Hurley amount to a total of 23,636 acres.
>
> Work was continued during the year in the No. 3 Hearst Tunnel on the south side of the Hearst ore body, there being 1,041 feet driven during the year. Prospect drilling was continued throughout the year near the Estrella ore body area. The data obtained from this work has shown a considerable addition to the known ore resources.
>
> Applying factors to the total tonnage of developed ore as of December 31, 1925, it is estimated that there will be produced from the Chino mines ore bodies, including stock pile, 105,242,094 tons of 1.44 per cent copper. At Chino mines approximately 75 per cent of the tonnage will be moved by shovel or other relatively low-cost open-pit methods, and the remaining 25 per cent, which lies at deeper horizons, will be mined by underground methods. Since the beginning of operations and up to the end of the year 1925 there have been mined at the Chino mines 31,954,586 tons of ore. Adding to this the estimated tonnage for future production, the total available and profitable ore disclosed and proven at the property since inception is 137,196,680 tons.
>
> *Construction and improvements at the mines.*—A Marion Model No. 92 electric shovel, equipped with tractors, was purchased and placed in service early in May. One more of the model 92 steam shovels was also equipped with tractors. Two class E Cyclone drills were purchased for use in the prospecting work. There were some additions to the machine-shop equipment and minor operating equipment. Development of water supply at the mine was continued throughout the year, together with changes in water lines made necessary through the development of pit areas. The grade for the diversion of Santa Rita Creek around the outside of the "North" and "Northwest" ore bodies was started and the work

[2] For a description of the geology of Bear Mountain, Burro Mountain, Chloride Flat, Fierro, Fleming, Georgetown, Hanover, Lone Mountain, Pinos Altos, and Santa Rita see Paige, Sidney, U. S. Geol. Survey Geol. Atlas U. S., Silver City folio (No. 199), 1916.

will be continued to completion, thus providing for extension of the "North," the "South," and "Southwest" ore-body pits.

Mining operations.—During January 17 shovel crews worked daily in two 9-hour shifts. Starting February 1 and continuing throughout the year, shovel operations were made continuous in three 8-hour shifts, beginning with 17 crews daily and completing the year with 19 crews daily.

The total ore and waste removed by power shovels was 5,054,325 cubic yards in place. Of this amount 3,281,334 cubic yards was stripping, the remainder being equivalent to 3,450,663 tons of ore. Of this ore 2,996,793 tons was sent to the mill, 42,031 tons was shipped direct to the smelter, and 411,839 tons net was added to the stock piles at Santa Rita. Of the ore shipped to the mill during the period under discussion 1.12 per cent was from the "Northwest" ore body, 26.57 per cent from the "North" ore body; 28.41 per cent from the "South" ore body, and 43.9 per cent from the "Southwest" ore body. During the year 1925, 4,861 tons of ore was mined and shipped to the mill from the prospect tunnel.

The average cost of shovel operations for removal of all classes of material was 56.89 cents per cubic yard. These costs include labor, supplies, and general expenses at the mine, but do not include general administration, State and county taxes, depreciation or charges for prepaid mine development.

Construction and improvements at the mill.—The installation of the filters in the dewatering department and the installation of three tube mills in section No. 1, also in section No. 2 in place of the Chilian mills, was completed. The new type of flotation installation was also finished in section No. 2 and additional tables installed in the concentrating department, these improvements requiring some alterations in other equipment in the plant. A new foundry was built, providing, first, the cupola and casting shed for making balls for the tube mills. This part of the installation was completed, and for several months chilled balls have been made, using plant accumulations of scrap iron and steel, at a cost for labor and other supplies approximating one-third of the cost of the balls purchased elsewhere.

Milling operations.—Five sections of the Hurley mill with the regrinding portion of a sixth section were in operation throughout the year. There was a total of 3,002,700 dry tons of ore treated, equivalent to an average of 8,226 tons per day, as compared to 7,394 tons per day for the operating period of 1924. The average content of the ore treated in the mill was 1.42 per cent copper, as compared with 1.59 per cent for 1924.

The total production of concentrates was 146,221 dry tons, averaging 23.45 per cent copper and corresponding to a recovery of 22.83 pounds per ton of ore treated. This is equivalent to an extraction of 80.54 per cent, as compared to 77.83 per cent for 1924. The recovery of copper occurring in the form of sulphides was 86.83 per cent, while the recovery of oxidized copper mineral was 45.95 per cent.

The average cost of milling was 76.06 cents per ton, as compared with 97.05 cents for 1924. The reduction in cost was effected the last of the year through the completion of mechanical improvements. During the month of October an average of 9,219 tons per day was treated at a cost of 65.29 cents per ton.

Copper production.—The production from copper contained in the concentrates was 68,558,303 pounds, as compared to 67,053,634 pounds for the year 1924. In addition to the copper from mill operations, crude ore shipped direct from mine to smelter brought the total production of copper up to 70,218,343 pounds, which, after allowing for smelter tolls, made the net output of refined copper 67,385,620 pounds.

General.—The condition of the equipment at the mine has been steadily improved, and with the additions of the model 92 electric shovel and the larger revolving-type shovel purchased in 1924 operating costs, as a whole, have been decreased, though owing to the fact that more shovels were operating in the hard capping of the Sierra ore body in the "Southwest" pit no decrease was made in actual cost of material moved. Further, in the last days of August very heavy precipitation occurred which filled the bottoms of the pits and delayed operations, which added to the cost of the year by the necessity of its removal. The large revolving-type electric shovel permitted the extraction of ore against high banks outside of the figured ore bodies. Altogether there were some 400,000 tons of ore recovered in the stripping areas which was not accounted for in ore calculations, the grade of the ore being practically the same as the average mined.

The mill was operated at considerably less than full capacity, only five of the seven sections being in service. The benefits from the various improvement expenditures are amply reflected in the increased recovery and decreased costs.

Mine production of gold, silver, copper, lead, and zinc in Central district, Grant County, N. Mex., 1924–25

Year	Ore	Gold	Silver	Copper	Lead	Zinc	Total value
	Short tons		*Fine ozs.*	*Pounds*	*Pounds*	*Pounds*	
1924	2,859,688	$71,121	38,200	66,824,015	1,183,626	16,921,000	$10,045,216
1925	3,159,167	97,299	76,547	68,812,280	2,363,260	15,033,000	11,269,879
Increase or decrease from 1924	+299,479	+26,178	+38,347	+1,988,265	+1,179,634	−1,888,000	+1,224,663

Chloride Flat district.—Iron-manganese ore shipments from the Clan and Seven Sisters claims, near Silver City, to the steel mill of the Colorado Fuel & Iron Co., at Pueblo, Colo., were larger in 1925 than in 1924. A carload of gold and silver ore was shipped from the Spot group, near Silver City.

Gold Hill district.—Gold ore from the Roosevelt mine was treated in a small amalgamation mill on the property.

Pinos Altos district.—The value of the metals from placer and lode mines in 1925 in the Pinos Altos district was $603 more than in 1924. The value of the gold from both placer and lode mines and also that for copper was less than in 1924, but a substantial increase in the output of lead and a larger yield of silver more than equalled the decreased value of copper and gold. Dry silver ore was shipped to smelters from the Langston and Silver Cell mines. Lead ore containing small quantities of silver was shipped from the Lead Hill mine to the smelter at El Paso. The placer output from small mines in 1925 was $529 in gold and 6 ounces of silver.

Mine production of gold, silver, copper, and lead in Pinos Altos district, Grant County, N. Mex., 1924–25

Year	Ore	Gold		Silver [1]	Copper	Lead	Total value
		Placer	Lode				
	Short tons			*Fine ozs.*	*Pounds*	*Pounds*	
1924	387	$1,042	$2,164	1,979	4,320	62,135	$10,069
1925	407	529	95	2,287	430	96,550	10,672
Increase or decrease from 1924	+20	−513	−2,069	+308	−3,890	+34,415	+603

[1] Includes placer production.

White Signal district.—A few tons of siliceous silver ore were shipped from the Copper Glance mine, near Whitewater, and some copper ore from the Eugenia mine. About two carloads of lead ore containing 5 ounces of silver to the ton and a low percentage of copper went to the El Paso smelter from the Woodward property.

GUADALUPE COUNTY

The Stauber mine, 2½ miles north of Pastura, began shipping ore to the El Paso smelter in July, 1925. The mine had no development prior to 1925. The ore shipped was oxidized copper ore mined through three shafts, each about 29 feet deep.

HIDALGO COUNTY

Eureka district.—A carload of copper ore was shipped from the Apache and Copper Crown mines.

Fremont district (*see also Luna County*).—About a carload of silver-lead ore was shipped from the Volney group.

Gillespie district (*Red Hill*).—Oxidized silver-lead ore of good grade was shipped to El Paso smelter from the Red Hill group.

Lordsburg district (*including Pyramid and Virginia or Shakespeare districts*).—In 1925 there was an increased demand at the copper smelter of Douglas, Ariz., for the highly siliceous gold-silver-copper ore of the Lordsburg district, and a large quantity of it was shipped from the Eighty-Five mine to the Calumet & Arizona smelter. Lessees on the Lone, Cochise, Atwood, and other mines shipped a considerable quantity of similar ore to the copper department of the smelter at El Paso, Tex. Lead ore was shipped from the Ada Etta and other properties. Dry silver ore from the Anita No. 2 mine was milled at a high ratio of concentration to make a low-grade silver concentrate that carried some copper. Five or six cars of dry and siliceous gold-silver ore were shipped from the Cobre Negra and other mines.

Mine production of gold, silver, copper, and lead in Lordsburg district, Hidalgo County, N. Mex., 1924–25

Year	Ore	Gold	Silver	Copper	Lead	Total value
	Short tons		*Fine ounces*	*Pounds*	*Pounds*	
1924	88,472	$192,203	113,591	4,927,878	40,412	$917,094
1925	108,219	222,823	126,781	5,064,140	69,700	1,035,981
Increase from 1924	19,747	30,620	13,190	136,262	29,288	118,887

Steins (*San Simon*) *district.*—Eight or nine cars of lead ore containing small quantities of silver were shipped from the Carbon Hill and Silver Hill mines, and the operators at the Granite Gap mine shipped several hundred tons of lead ore that contained about 11 ounces of silver to the ton.

LINCOLN COUNTY

The Homestake amalgamation mill at Whiteoaks ran for a short period in 1925. Two small cars of copper ore were shipped from Oscura and Carrizozo.

LUNA COUNTY

Cooks Peak district.—More than 1,300 tons of silver-lead ore were shipped to smelters from the Desdemona, Inez, and Graphic mines. About 350 tons of lead-zinc ore, about half of which was oxidized, were also shipped.

Fremont district (*see also Hidalgo County*).—About six cars of silver-lead ore were shipped from the Keno mine.

Tres Hermanas district.—The only shipments in 1925 were a few tons of lead ore from the Cincinnati and Ole Nigger mines.

Victorio district (*Gage*).—Several hundred tons of silver-lead ore were shipped from Gage in 1925.

OTERO COUNTY

Orogrande district.—Four or five cars of copper ore containing some gold and silver were shipped from the Orogrande district in 1925.

Sacramento Mountains district (*Alamogordo*).—Several hundred tons of lead ore containing a little silver and copper were shipped from the Alamo group.

SAN MIGUEL COUNTY

No work was done in 1925 at the Pecos mine, on Willow Creek, other than unwatering the mine for examination. Early in 1926 the Goodrich Lockhart Co. transferred the management and operation of the mine to the American Metal Co. The property has been under development in 1926 while a 500-ton gravity concentration and flotation plant and a 12-mile tramway were being built. Milling will not begin until January, 1927.

SANTA FE COUNTY

New Placers district (*Golden*).—A 50-ton gravity concentration and oil-flotation plant was operated at the Amazon-Anaconda-Lincoln-Lucky group by the Collier Mines Co., which shipped lead concentrates and lead-zinc concentrates. Both classes of concentrates contained some gold and silver. Lessees worked the San Pedro mine and shipped gold-silver-copper ore to El Paso. When formerly worked by the Santa Fe Gold & Copper Mining Co., the mine was opened by a 150-foot shaft and several adits. The Santa Fe and other small placer mines produced $519 in gold by sluicing in 1925.

SIERRA COUNTY

Chloride district (*Apache, Cuchillo Negro*).—The Bald Eagle and other mines shipped a small quantity of copper ore with a silver content of considerable value. Some lead sulphide ore was also shipped from the Bald Eagle property.

Hillsboro district (*Las Animas*).—A carload of copper ore was shipped from the Empire mine and a small shipment of dry gold ore was made from the Wicks mine.

Kingston district.—The only shipments in 1925 were a few tons of dry silver ore and of lead ore.

Lake Valley district.—The larger part of the ore shipped from Sierra County in 1925 was dry silver ore from the Lake Valley mine. Several cars of lead ore were sorted from old dumps at the Independence mine and shipped to El Paso.

Mine production of gold, silver, copper, and lead in Sierra County, N. Mex., 1924–25

Year	Ore	Gold	Silver	Copper	Lead	Total value
	Short tons		*Fine ounces*	*Pounds*	*Pounds*	
1924	42	$527	1,297	3,787	4,901	$2,284
1925	2,545	1,825	23,090	6,300	38,930	22,132
Increase from 1924	2,503	1,298	21,793	2,513	34,029	19,848

SOCORRO COUNTY

Shipments of ore from Socorro County increased in 1925, as did the quantity of gold, silver, and lead. There was a decrease of 12 per cent in the quantity of copper and a decrease of 653,800 pounds, or 17 per cent, in zinc. The total value of the gold, silver, copper, lead, and zinc was $484,059 in 1925 against $399,219 in 1924.

Magdalena district (Kelly).—Lessees on the Graphic-Waldo claims of the Ozark Smelting & Refining Co. shipped about two-thirds of the ore of the district; their shipments comprised lead sulphide, zinc-lead sulphide, and zinc-lead oxide ores. About six cars of old smelter dump material containing lead, copper, gold, and silver were shipped. A lessee on the Kelly group shipped several hundred tons of lead and lead-zinc ore. Copper sulphide ore, zinc oxide ore, lead oxide, and lead sulphide ore were shipped from the Nitt claim and from the Juanita. Operators of the Mistletoe and Black Cloud mines also shipped several hundred tons of lead ore. The total shipments of ore from the district in 1925 were 12,356 tons, of which 368 tons were copper ore, 6,774 tons lead-zinc ore, 511 tons zinc ore, and 4,703 tons lead ore.

Salinas Peak district.—A few tons of lead ore were shipped from the Bullion King mine.

San Acacia district.—The only output was a small car of lead ore.

Socorro district.—A few tons of lead ore containing silver and copper were shipped from Elsie No. 1 and No. 2 claims.

VALENCIA COUNTY

Blue Water district.—The only shipment of ore in 1925 from Valencia County was a car of copper ore from the Blue Water district.

SILVER AND LEAD IN TEXAS

(MINE REPORT)

By Charles W. Henderson

Mine production of silver and lead in Texas, 1924–25

Year	Ore (short tons)	Recovered metal content				Total value
		Silver		Lead		
		Fine ounces	Value	Pounds	Value	
1924	84,744	720,739	$482,895			$482,895
1925	72,737	552,000	383,088	16,000	$1,392	384,480
Increase or decrease from 1924	−12,007	−168,739	−99,807	+16,000	+1,392	−98,415

PRESIDIO COUNTY

The Presidio mine, in the Shafter district, has been worked since 1884. The ore mined is an oxidized silver ore from replacement deposits, and the underground workings are said to exceed 30 miles in length. The property is equipped with a 200-ton cyanidation mill where crushing is done with two Blake crushers, 15 stamps (1,100 pounds each), and is followed by fine grinding in two 4½ by 18 foot tube mills, classifying, agitating in cyanide solution, filtering, and precipitating by zinc in the Merrill-Crowe process. This mine has produced the largest part of the output of silver in Texas, which from 1885 to 1925 amounted to 18,540,043 ounces, having a commercial value of $13,618,558.

SILVER, COPPER, LEAD, AND ZINC IN THE CENTRAL STATES[1]

(MINE REPORT)

By J. P. Dunlop and H. M. Meyer

INTRODUCTION

The silver, copper, lead, and zinc mines of the Central States are in Arkansas, Illinois, Kansas, Kentucky, Michigan, Missouri, Oklahoma, and Wisconsin. The territory thus embraced lies in the great interior valley province of the United States, which extends from Appalachian system to the Rocky Mountain front, exclusive of the Black Hills. Most of the mines are in the Paleozoic sedimentary rocks of this province, but the copper range of northern Michigan comprises lavas and intercalated sediments of pre-Cambrian age.

In the lead and zinc regions of the Central States the material sold is mainly concentrates,[2] and payment is made according to a basic price for concentrates of a certain quality. The details of this method are given in the pages devoted to Missouri in this report for 1914. The figures reported by producers represent the quantity and assay contents of concentrates sold and the amount received in payment. The total metal produced is calculated from the first two of these items.

The operators in Michigan report the quantity of concentrates produced and the actual recovery of copper from concentrates smelted.

In any year the mines may produce more or less concentrates than are smelted during the same period. The copper content of concentrates produced but not smelted during the year has been estimated on the basis of the average copper recovery per ton for the year of the company producing it.

TENOR OF LEAD AND ZINC ORES OF THE CENTRAL STATES

Much of the ore mined in the Western States is crude smelting ore—that is, it can be smelted directly without preliminary concentration. All but a very small part of the ore from the Central States, however, is of such tenor that it requires concentration. The only fair basis for comparison of the relative magnitude of mining opera-

[1] A bibliography is given in Mineral Resources for 1919 and some preceding volumes.

[2] In local usage the ore as mined is called "dirt" and the concentrates are classed as "ore." Where the capacity of a concentrating plant is given, such capacity is to be understood as based on a 10-hour shift unless otherwise stated.

tions in different States is that of quantity of crude ore, or "dirt." In Kentucky and southern Illinois the lead and zinc concentrates are recovered as by-products in the concentration of the fluorspar that they accompany, and it is not possible to calculate the metal content of the crude ore raised.

Quantity and tenor of copper, lead, and zinc ores of Central States, 1923–1925

State	1923		1924		1925	
	Crude ore	Metal content [1]	Crude ore	Metal content [1]	Crude ore	Metal content [1]
	Short tons	*Per cent*	*Short tons*	*Per cent*	*Short tons*	*Per cent*
Arkansas	[2]		[2]		[2]	
Illinois (northern)	86,100	2.10	148,300	1.71	232,000	1.49
Kansas	2,680,700	4.26	3,215,000	4.09	4,165,000	3.87
Michigan	5,363,160	1.29	5,372,572	1.26	7,036,751	1.10
Missouri	6,098,900	3.16	6,518,800	3.30	6,872,000	3.38
Oklahoma	7,937,200	4.20	8,804,000	4.24	10,605,200	3.81
Wisconsin	454,000	3.34	652,000	2.97	1,003,700	2.72
	22,620,060		24,710,672		29,914,651	

[1] The percentages given in this column represent the metal content of the ore in so far as it is recovered in the concentrates. In Michigan the metal so recovered is copper, in the other Central States the metals are lead and zinc, the relative proportions of which are shown in the table on another page and in the tables of tenor of ore given in the sections devoted to the respective States.
[2] No record of ore treated.

The marked increase in 1925 shown by this table was distributed mainly among the lead and zinc mines of Oklahoma and Kansas and the copper mines of Michigan. Smaller increases in the output of lead and zinc ores occurred in Missouri, Wisconsin, and Illinois. The output of disseminated lead ore in southeastern Missouri increased 150,100 tons.

The low average tenor of the crude ore mined in the Central States in 1925 is best shown by the fact that the average value of the total metal content was only $4.83 a ton of crude ore treated. This value was 14 cents more than in 1924, because of the higher price of copper, lead, and zinc. The 22,877,900 tons of zinc, lead, and lead-zinc ores treated in the Central States exclusive of southern Illinois, Kentucky, and Arkansas in 1925 yielded lead and zinc concentrates that sold for $91,317,629, consequently the mine operators realized an average of $3.99 a ton of ore mined and treated, compared with $3.59 a ton in 1924. The value of both lead and zinc concentrates was greater in 1925 than in 1924. The quantity of lead concentrates increased about 39,500 tons; the quantity of zinc concentrates increased about 90,400 tons.

PRODUCTION

GENERAL STATISTICS

The total value of the mine production of silver, copper, lead, and zinc in the Central States in 1925 was $28,569,259 more than the value for 1924. The total value for 1907 to 1925 was $1,870,044,803—$718,277,702 for zinc, $628,576,102 for copper, $516,397,882 for lead, and $6,793,117 for silver. The value of the zinc has been much greater than that of the copper for the last seven years, hence the total value of the zinc produced during the period is nearly $90,000,000 more than that of the copper.

Mine production of silver, copper, lead, and zinc in the Central States in 1925, by States

State	Silver		Copper		Lead		Zinc		Total value
	Fine ounces	Value	Pounds	Value	Short tons	Value	Short tons	Value	
Arkansas	3,118	$2,164			58	$10,092	43	$6,536	$18,792
Illinois	3,000	2,082			1,001	174,174	2,724	414,048	590,304
Kansas					22,775	3,962,850	118,778	18,054,256	22,017,106
Kentucky					152	26,448	429	65,208	91,656
Michigan	139,499	96,812	155,157,488	$22,032,363					22,129,175
Missouri	83,340	57,838	12,100	1,718	211,566	36,812,484	14,794	2,248,688	39,120,728
Oklahoma					79,946	13,910,604	283,371	43,072,392	56,982,996
Wisconsin					1,877	326,598	20,230	3,074,960	3,401,558
	228,957	158,896	155,169,588	22,034,081	317,375	55,223,250	440,369	66,936,088	144,352,315
Total, 1924	242,966	162,787	135,845,416	17,795,749	282,760	45,241,600	404,484	52,582,920	115,783,056

Silver.—Nearly all the silver that has been produced in the Central States has been recovered incidentally in the production of other metals. The output in 1925 from the copper lodes of Michigan showed an increase of 9,118 ounces, and that from the refining of lead bullion from Missouri decreased 20,348 ounces. The lead-zinc fluorspar deposits of the Kentucky-Illinois field also carry silver, and the silver recovered from the lead concentrates from Illinois was 3,000 ounces, a decrease of 5,891 ounces. The remainder of the silver was derived from lead-zinc ore mined in Pike County, Ark., except 6 ounces from copper ore mined in Missouri.

Copper.—The mine production of copper in the Central States in 1925 came from Michigan and Missouri. Michigan, which, as in other years, contributed nearly all of the output, produced 19,494,883 pounds more than in 1924. The copper produced in Missouri was derived entirely from copper ore, as none of the copper concentrates derived from lead ores was treated in 1925.

Lead.—The mine production of lead in the Central States in 1925 increased 12 per cent. Missouri produced 66.7 per cent of the yield, against 67.2 per cent in 1924, and the recoverable lead content of galena and lead carbonate concentrates mined in Missouri was equivalent to 32.3 per cent of the refined primary lead recovered in the United States from domestic ore. Of the total output in Missouri the disseminated-lead district of southeastern Missouri produced 208,836 tons, again exceeding the output of the Coeur d'Alene district of Idaho and that of the State of Utah, and retaining first place in the production of lead in the United States. Small shallow lead mines and barite mines in southeastern Missouri reported the recovery of 79 tons of lead. Southwestern Missouri had an output of 2,651 tons, or 459 tons more than in 1924. The production in Oklahoma increased from 71,358 tons in 1924 to 79,946 tons in 1925. The production from Kansas mines increased from 18,560 tons in 1924 to 22,775 tons in 1925. Production in Illinois decreased from 1,464 to 1,001 tons, and in Wisconsin increased from 1,254 to 1,877 tons. The total output of lead from mines in the southern Illinois-Kentucky region, Arkansas, and the upper Mississippi Valley amounted to less than 1 per cent of the output of the Central States.

Zinc.—The mine production of zinc in the Central States was 79 per cent of the total smelter output of primary zinc from domestic ores in the United States, as compared with 78 per cent in 1924. Oklahoma produced 283,371 tons of zinc in 1925, against 269,137 tons in 1924. For many years, until 1917, Missouri had been the largest producer of zinc in the United States, but the output decreased from 132,918 tons in 1917 to 14,794 tons in 1925. The production of zinc in Kansas rose from 56,225 tons in 1922 to 100,969 tons in 1923, 105,392 tons in 1924, and 118,778 tons in 1925. The Arkansas output increased from 4 tons in 1924 to 43 tons in 1925, Kentucky decreased from 492 to 429 tons, and Illinois increased from 2,512 to 2,724 tons. No production of lead or zinc was reported from Iowa mines in 1925.

PRODUCTION OF LEAD AND ZINC BY REGIONS

The productive lead and zinc territory in the Central States naturally falls into seven regions, three of which are not limited to a single State. For statistical purposes the tables showing the production of lead and zinc by States are necessary, but for practical purposes it is desirable to show the production by the natural regions irrespective of State lines.

The seven regions, in order of size of output, are: (1) The Joplin region, comprising southwestern Missouri, southeastern Kansas, and northeastern Oklahoma; (2) southeastern Missouri, containing the great deposits of disseminated lead; (3) the upper Mississippi Valley region, including all the lead and zinc mines in southwestern Wisconsin, Iowa, and northwestern Illinois; (4) the fluorspar region in southern Illinois and northern Kentucky; (5) Arkansas; (6) central Missouri; (7) the Arbuckle Mountain region, in southern Oklahoma.

The southeastern Missouri region produced 65.8 per cent of the lead output of the Central States and 31.9 per cent of the primary lead recovered from domestic ore smelted or refined in the United States in 1925. The Joplin region yielded 33.2 per cent of the lead and 94.7 per cent of the zinc of the Central States in 1925 and was much the largest producer of zinc in the United States, yielding 75 per cent of the total zinc produced from domestic ores in 1924 and in 1925.

The lower zinc content of the zinc concentrates produced at mines in the upper Mississippi Valley region is clearly indicated by the fact that, although these mines yielded 9.9 per cent of the total output of raw zinc concentrates of all classes, the zinc content of such concentrates was only 5.1 per cent of the zinc from mines in the Central States.

The lead content of the galena concentrates shipped from the upper Mississippi Valley region averaged about 74 per cent, that of the concentrates from the Joplin region averaged about 78.9 per cent, and that of the concentrates from the southeastern Missouri region averaged 67.6 per cent. A very small proportion of the galena shipped from the Joplin region contained more than 82 per cent lead. A large part of the sphalerite shipped from the Joplin region contained about 59 or 60 per cent of zinc and the 34,116 tons shipped from the Waco district in that region averaged 61.2 per cent.

Mine production of lead and zinc in the Central States in 1925, by regions

Region	Lead [1]		Zinc [2]		Total value
	Short tons	Value	Short tons	Value	
Concentrates:					
Joplin	136,408	$15,988,612	806,050	$41,332,561	$57,321,173
Southeastern Missouri [3]	314,403	31,727,170			31,727,170
Upper Mississippi Valley [4]	3,249	343,226	88,511	1,926,060	2,269,286
Kentucky-southern Illinois	1,048	99,543	1,880	65,540	165,083
Arkansas	93	8,546	102	3,676	12,222
Total, 1924	455,201	48,167,097	896,543	43,327,837	91,494,934
	415,040	37,824,657	806,112	31,801,538	69,626,195
Metal:					
Joplin	105,372	18,334,728	416,943	63,375,336	81,710,064
Southeastern Missouri [3]	208,915	36,351,210			36,351,210
Upper Mississippi Valley [4]	2,355	409,770	22,587	3,433,224	3,842,994
Kentucky-southern Illinois	675	117,450	796	120,992	238,442
Arkansas	58	10,092	43	6,536	16,628
Total, 1924	317,375	55,223,250	440,369	66,936,088	122,159,338
	282,760	45,241,600	404,484	52,582,920	97,824,520

[1] Includes both galena and a small quantity of lead carbonate concentrates.
[2] Includes sphalerite, zinc carbonate, and zinc silicate concentrates.
[3] Includes a small production from the central Missouri region.
[4] Includes Iowa, northern Illinois, and Wisconsin.

Mineral Resources for 1914 contains brief reviews of the history of lead and zinc mining in the Central States, the yearly production of each State for the period 1907 to 1914, inclusive, and historical notes and estimates of the total production of lead and zinc in each State before 1907.

ARKANSAS

By J. P. Dunlop

The value of the lead and zinc from Arkansas mines was $1,430,668 in 1917, but only $16,628 in 1925. The decrease in shipments was caused almost entirely by the slow demand for zinc carbonate concentrates during most of 1925; the demand offered little encouragement to owners of old mines and did not invite the investment of new capital, which is needed to revive the industry. Very small amounts of milled zinc concentrates are produced in Arkansas, a fact that militates against the sale of zinc ores; few smelters desire to purchase hand-cobbed zinc carbonate or sphalerite, as they are not equipped to crush the ore before placing it in the retorts.

Late in the year there were inquiries from chemical companies for zinc carbonate ore, and several mines were reopened, though they made few shipments in 1925.

The production of galena in Arkansas is small compared with that in other regions. The shipments of zinc carbonate and zinc silicate concentrates, 44 tons, were less than 1 per cent of the shipments in 1917. Some sphalerite concentrates were mined and shipped from Pike County, in southern Arkansas, also some galena concentrates. Both galena and sphalerite carried a good content of silver, and 3,118 ounces of silver, valued at $2,164, was recovered in 1925.

Mine production of lead and zinc in Arkansas, 1907–1925 [1]

Year	Lead concentrates (galena)		Zinc concentrates				Metal content			
			Sphalerite		Silicate and carbonate		Lead		Zinc	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1907–1915	416	$22,348	8,576	$315,910	12,221	$506,842	331	$29,394	8,290	$1,365,538
1916	339	28,097	1,670	112,726	16,609	940,224	272	37,536	6,815	1,826,420
1917	474	47,593	916	57,824	17,053	650,585	382	65,704	6,691	1,364,964
1918	155	13,594	310	16,450	2,156	68,333	120	17,040	951	173,082
1919	35	2,400			510	18,170	28	2,968	189	27,594
1920	10	755			917	28,925	8	1,280	329	53,298
1921	27	1,510			42	580	21	1,890	15	1,500
1922	55	4,000			425	6,870	42	4,620	134	15,276
1923	32	2,559			444	9,919	25	3,500	148	20,128
1924	25	2,730			13	330	20	3,200	4	520
1925	93	8,546	58	2,380	44	1,296	58	10,092	43	6,536

[1] In calculating the metal content of the ores from assays allowance has been made for smelting losses of both lead and zinc in 1921 to 1925. In comparing the values of ore and metal it should be borne in mind that the value given for the ore is that actually received by the producer, whereas the value of the lead and zinc is calculated from the average price for all grades.

Tenor of lead and zinc ore and concentrates produced in Arkansas, 1922–1925

	1922	1923	1924	1925
Total crude ore, short tons			(1)	(1)
Average lead content of galena concentrates, per cent	78.2	78.1	80.0	63.4
Average zinc content of zinc silicate and carbonate, do	36.0	37.8		44.0
Average value per ton:				
Galena concentrates	$72.73	$79.97	$109.20	$91.89
Zinc silicate and carbonate	$16.16	$22.34	$25.38	$29.45

[1] The quantity of ore mined was very small, and very little of it was milled, so that no calculations as to tenor are available; part of the ore sold was taken from stock in bins.

The mines are chiefly in Boone and Marion Counties and the adjoining portions of Searcy and Newton Counties though there are numerous prospects in Baxter, Izard, Sharp, Lawrence, and other counties to the east, and deposits have been worked in Washington and Sevier Counties, on the extreme western border of the State, and in Pike County in the southwestern part of Arkansas.

The ores are galena, sphalerite, and smithsonite, and the concentrates produced are generally of high grade and free or nearly free from iron or lime. The sphalerite and smithsonite are shown by analysis to contain appreciable quantities of cadmium, especially in a yellow variety of smithsonite known locally as "turkey fat," which shows as much as 0.8 per cent of cadmium.

Few of the lead and zinc mines of Arkansas were worked in 1925, and none of those from which concentrates were shipped were operated steadily. Shipments of lead and zinc ores in 1925 came from five small mines, and the value of the concentrates shipped increased from $3,060 in 1924 to $12,222 in 1925. The Salina, Minnie Lee, Boone County, Elixir, and Gloria mines produced all the zinc carbonate.

The only shipments of galena concentrates from Marion County in 1925 were made by B. Lawhorn, Joe Hampton, and others at Short Mountain. Some galena was shipped by the Eagle-Picher Lead Co. from property near Ponca, Newton County, before the lease was abandoned. No shipments were reported by the lessees of the American Zinc, Lead & Smelting Co.'s land in Newton County, though some development was done; a 100-ton mill was under construction at the Bald Hill mine and is in operation in 1926. Mining was renewed in the Zinc and Dodd City districts late in the year, several old mines being reopened and a little zinc carbonate sold. The Kellogg mine near Camp Pike in Pike County, which has a shaft of 900 feet, several thousand feet of drifts run, and a 75-ton flotation plant, has been abandoned. Some lead concentrates averaging 65 per cent lead and 46 ounces of silver were shipped and one car of zinc concentrates was sold in 1925. The zinc concentrates averaged 54.9 per cent zinc, 3.9 per cent lead, and small quantities of silver and copper. At Rush Creek, in Marion County, the Morning Star Mining Co., which controls several of the old productive mines, did considerable development work. The 300-ton mill was remodeled and the flow sheet changed. The old tailings will be remilled and ore will be drawn from the Morning Star, Philadelphia, and other mines.

The mill at the Montreal mine in Searcy County was repaired and pumps and an air compressor installed.

ILLINOIS

By J. P. Dunlop

PRODUCTION

Mine production of lead and zinc in Illinois in 1925, by districts[1]

District	Lead concentrates (galena)		Zinc concentrates (sphalerite)		Metal content[2]			
					Lead		Zinc	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Northern Illinois	621	$65,646	11,294	$176,638	478	$83,172	2,357	$358,264
Southern Illinois	797	75,924	663	35,800	523	91,002	367	55,784
Total, 1924	1,418	141,570	11,957	212,438	1,001	174,174	2,724	414,048
	2,230	191,443	8,652	163,603	1,464	234,240	2,512	326,560

[1] Mineral Resources for 1914 contains a historical review of lead and zinc mining in Illinois.

[2] In calculating the metal content of the ores from assays allowance has been made for smelting losses of both lead and zinc. In comparing the values of ore and metal it should be borne in mind that the value given for the ore is that actually received by the producer, whereas the value of the lead and zinc is calculated from the average price for all grades.

Tenor of lead and zinc ore and concentrates produced in Illinois, 1922–1925

	1922	1923	1924	1925
Northern Illinois				
Total crude ore, short tons	66,150	86,100	148,300	232,000
Total concentrates in crude ore:				
Lead, per cent	1.18	0.35	0.38	0.27
Zinc, do	12.55	5.54	4.72	4.87
Metal content of crude ore:				
Lead, do	.88	.25	.26	.21
Zinc, do	5.83	1.85	1.45	1.28
Average lead content of galena concentrates, do	74.2	71.0	71.2	78.6
Average zinc content of sphalerite concentrates, do	40.6	33.4	30.7	26.3
Average value per ton:				
Galena concentrates	$64.48	$77.54	$93.92	$105.71
Sphalerite concentrates	$19.98	$15.77	$16.07	$15.64
Southern Illinois				
Average lead content of galena concentrates, per cent	70.2	67.6	65.6	67.0
Average zinc content of sphalerite concentrates, do			59.77	59.9
Average value per ton of galena concentrates	$69.69	$75.68	$83.19	$95.26

Mine production of silver in southern Illinois, 1907–1925

Year	Silver		Lead concentrates, silver bearing		Year	Silver		Lead concentrates, silver bearing	
	Fine ounces	Value	Short tons	Ounces of silver per ton		Fine ounces	Value	Short tons	Ounces of silver per ton
1907–1915	25,220	$14,371	4,199	6.00	1921	1,345	$1,345	181	7.43
1916	5,684	3,740	874	6.50	1922	6,025	6,025	1,100	5.48
1917	7,186	5,921	1,239	5.80	1923	8,170	6,699	1,762	4.64
1918	8,171	8,171	1,228	6.65	1924	8,891	5,957	1,678	5.30
1919	4,440	4,973	715	6.16	1925	3,000	2,082	797	3.76
1920	8,193	8,930	1,252	6.55					

The value of the mine production of silver, lead, and zinc in Illinois in 1925 was $590,304, as compared with $566,757 in 1924. The increase was due entirely to the larger quantity of zinc shipped and the higher price. Silver decreased in quantity and value.

The lead and zinc deposits of Illinois fall into two distinct regions marked by different mineral associations and structural environment. Those of southern Illinois belong to the Kentucky-Illinois fluorspar district; those of northern Illinois belong to the upper Mississippi Valley region.

NORTHERN ILLINOIS

The lead and zinc mines of northern Illinois are all in Jo Daviess County, the extreme northwestern county of the State. The ores are galena, smithsonite, and sphalerite, though the first two are much less common now than formerly, when most of the deposits worked were shallow and above water level.

The entire output of northern Illinois is included under the Galena district, which comprises the mines from the vicinity of Fever River to the Wisconsin State line.

A moderate increase in the quantity of crude ore and considerable increases in concentrates from northern Illinois are shown in the accompanying tables. The average zinc content of concentrates recovered decreased, but the ratio of concentrates to crude ore increased slightly. Most of the lead and zinc concentrates came from the Black Jack mine of the Mineral Point Zinc Co.

Tailings were milled by the Unity Concentrating Co. and by A. Hollander. Small operators did very little mining and virtually no prospecting. No new deposits of any importance were discovered.

SOUTHERN ILLINOIS

The lead and zinc deposits of southern Illinois are in Pope and Hardin Counties; they occur in rocks of Mississippian age in the northern extension of the Kentucky-Illinois fluorspar district. The chief product of the mines in recent years has been fluorspar, and the yield of galena is small compared with the output from other districts in the Central States.

The total production of galena concentrates in southern Illinois from 1906 to 1925 has been 15,228 tons, most of which has been shipped from the Fairview, Rosiclare, and Hillside mines. The shipments of zinc ores from the district have been comparatively small and scattered. The only recorded shipments of zinc carbonate, aggregating 103 tons, were made from the Empire mine in 1903 or 1904 and from four companies in 1906.

Formerly large bodies of galena near the surface were worked, but galena is now produced incidentally in the concentration of the fluorspar. For this reason it would be misleading to give the quantity of crude ore. The galena of southern Illinois is notably argentiferous as compared with the rest of the Mississippi Valley ores, and the silver content averaged between 3.76 and 7.43 ounces to the ton of lead concentrate for the last 10 years.

Sphalerite, or zinc blende, occurs much less plentifully than galena, and the first large shipments of sphalerite in many years were made in 1924 from the new 250-ton plant of the Fairview Fluorspar & Lead Co. The sphalerite shipped in 1925 had an average zinc content of 59.9 per cent.

The shipments of galena concentrates decreased from 1,678 tons in 1924 to 797 tons in 1925, and the silver recovered in treating the concentrates decreased from 8,891 to 3,000 ounces, owing to the idleness of the fluorspar mines during part of the year.

The Franklin Fluorspar Co. worked the Good Hope vein of the Fairview mine, which was first developed in 1862; the output was less than in 1924.

The Rosiclare Lead & Fluorspar Mining Co. mill is designed to handle 500 tons a day and is provided with special facilities for saving the lead and zinc, both by jigs and tables. The Hillside Fluor Spar Mines' mine and concentrating plant near Rosiclare was operated in 1925. The shaft is 450 feet deep, and the milling plant has a capacity of 200 tons (eight-hour shift). The galena concentrate, assaying 67 per cent lead and about 4.8 ounces of silver a ton, was shipped to the St. Louis plant of the National Lead Co.

The company purchased the Keystone mine near Marion, Ky., but did not work it during 1925. A small quantity of lead concentrate was sold by the Illinois Fluorspar & Lead Co .of Cave-in-Rock.

IOWA

The lead and zinc deposits of Iowa extend along the Mississippi River for nearly 80 miles, in Dubuque, Clayton, and Allamakee Counties. No shipments of lead or zinc concentrates from mines in Iowa have been reported since 1918.

KANSAS

By J. P. Dunlop

Mine production of lead and zinc in Kansas in 1925, by districts

District	Lead concentrates [1]		Zinc concentrates [2]		Metal content [3]			
					Lead		Zinc	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Crestline	1,623	$194,258	5,988	$316,255	1,296	$225,504	3,161	$480,472
Blue Mound-Baxter Springs	27,051	3,218,604	200,043	10,494,327	20,892	3,635,208	103,631	15,751,912
Galena	734	77,051	447	23,055	535	93,090	222	33,744
Waco (in Kansas)	72	7,766	21,905	1,200,750	52	9,048	11,764	1,788,128
Total, 1924	29,480	3,497,679	228,383	12,034,387	22,775	3,962,850	118,778	18,054,256
	23,888	2,593,285	199,627	8,488,453	18,560	2,969,600	105,392	13,700,960

[1] Includes 142 tons of lead carbonate from Galena.
[2] Includes 38 tons of zinc silicate from Galena.
[3] In calculating the metal content of the ores from assays allowance has been made for smelting losses of both lead and zinc. In comparing the values of ore and metal it should be borne in mind that the value given for the ore is that actually received by the producer, while the value of the lead and zinc is calculated from the average price for all grades.

Tenor of lead and zinc ore and concentrates produced in Kansas, 1923–1925

	1923	1924	1925
Total crude ore, short tons	2,680,700	3,215,000	4,165,000
Total concentrates in crude ore:			
Lead, per cent	0.84	0.74	0.76
Zinc, do	5.98	5.84	5.52
Metal content of crude ore:			
Lead, do	.67	.59	.60
Zinc, do	3.59	3.50	3.27
Average lead content of galena concentrates, do	79.4	79.4	78.9
Average zinc content of sphalerite concentrates, do	60.0	60.0	59.1
Average value per ton:			
Galena concentrates	$96.78	$108.70	$115.39
Sphalerite concentrates	$40.76	$42.52	$52.70

The lead and zinc deposits of Kansas, so far as developed, are limited to Cherokee County, in the southeastern part of the State. They form the western extension of the ore deposits of the Joplin

region and display the general characteristics shown in that region, except that here typical sheet-ground deposits have not been extensively developed.

It is difficult to ascertain the production for early years or to segregate the Kansas ores from those produced in the Missouri portion of the Joplin region. If to the figures for 1886 to 1903, published by the Kansas Geological Survey,[3] are added those for 1904 to 1925, published in Mineral Resources of the United States, a total of 2,132,463 tons of zinc concentrates and 325,402 tons of lead concentrates is shown as the approximate production of Kansas for 1886 to 1925. About 68 mines, of which 49 are in the Blue Mound-Baxter area, shipped lead or zinc in 1925.

The older mining area at Lawton and Badger-Peacock produced no zinc and lead in 1925, and nearly all the production from Kansas came from the Blue Mound-Baxter district, an extension of the Miami field, and the Waco camp, on the Kansas-Missouri State line. The Crestline district was unwatered, and the output of zinc was 5,579 tons more than in 1924.

Crestline district.—The production in the Crestline district, including shipments of galena and sphalerite from mines west of Badger, was 1,623 tons of galena and 5,988 tons of sphalerite, against 1,681 tons of galena and 409 tons of sphalerite in 1924. The Jackson mine, on the Chanute Spelter Co.'s lease, was worked by Andrew Bros.; it contributed about two-thirds of the lead concentrates shipped from the district in 1925, producing about 2 tons of lead to 1 of zinc. The output of the Cavern mine also was nearly all galena concentrates; they were milled at a small plant erected in 1925.

The Ellis and Crutchfield mines and mills of the Eagle-Picher Lead Co. were operated part of the year. A large amount of drilling and underground development was done.

The Kanok Mining Co. plant was idle and the mill of the Underwriters Land Co. was removed from Crestline. The Crestline Service & Products Co. rearranged its mill and ran steadily the last part of 1925. Drilling was active at Crestline in 1925 and virtually all the lands in the vicinity of producing properties are under lease.

Lawton-Waco district.—The output of the Lawton-Waco district came from the mines near Waco, as the one property at Lawton—that of the Eastern Lead & Zinc Co.—was idle. The total output of the Waco district, lying partly in Missouri and partly in Kansas, was 34,116 tons of sphalerite and 223 tons of galena, against 45,410 tons of sphalerite and 423 tons of galena in 1924. The production of the Kansas part of the district was 21,905 tons of sphalerite and 72 tons of galena, as compared with 24,598 tons of sphalerite and 234 tons of galena in 1924. The chief producers in the Kansas part of the district were the Butte-Kansas and the Acme mines, which were steadily busy. Four shafts were operated at the Butte-Kansas mines in ore at 220 to 235 feet. The Butte-Kansas mill has a capacity of 400 tons a shift. Three shafts were operated at the Acme; ore was mined at the 200-foot level and from a newly opened deposit at 285 to 290 feet. The old Acme 125-ton mill is to be replaced by a modern 300-ton plant to handle the increased output of ore from lower levels. Barns-

[3] Haworth, Erasmus, and others, History, Geography, and Metallurgy of Galena-Joplin Lead and Zinc: Univ. Kansas Geol. Survey, vol. 8, 1904.

dall No. 3 had a fair production. Four shafts were used to hoist ore for the 300-ton mill.

Freehold No. 3, the only other producing mine on the Kansas side, was operated by sublessees, known as At Last Mining Co., until a cave-in destroyed part of the mill. Barnsdall No. 1, which had been idle for several years, was transferred to the Grasselli Chemical Co., and the mine unwatered, the mill rebuilt, and the lease drilled. Two shafts were used to mine ore at the 190-foot level.

Galena district.—The production of lead concentrates in the Galena district was 592 tons of galena and 142 tons of lead carbonate, as compared with 379 tons of galena and 113 tons of lead carbonate in 1924. There were small shipments of sphalerite concentrates, 409 tons, derived from old dumps cleaned at chat mills and from two mines in the southwest part of the district. The galena was derived from clean-ups or from shallow mining, as the mines are flooded and no pumping was done in the years 1922 to 1925.

The largest producer of sphalerite was the D. A. Mining Co.; it operated an 80-ton mill on the Wyandotte land that was dewatered and opened in 1925. Small shipments of galena, lead carbonate, zinc silicate, and sphalerite were made by lessees on the Bonanza, Empire, Connor, and Templar lands. Hand jigs were used to clean much of the ore and the only mills active were those of the McKinney Mining Co. and the D. A. Mining Co. An effort to have all landowners and lessees take concerted action to unwater the district was unsuccessful. The cut-ground area is large and most of the old mines are connected underground so that few of the mines can be worked below the water level until the entire district is unwatered.

Blue Mound-Baxter Springs district.—There was not much drilling in the north of Cherokee County but many drill rigs were busy around Baxter Springs, west along the Chetopa road, and on the road between Baxter Springs and Blue Mound. Considerable drilling was also done near Melrose, 6 miles west of the producing properties in Kansas. A considerable number of holes drilled by the Universal Exploration Co., Rialto Mining Co., Golden Rod Mining & Smelting Co., Frank Childress, and others found ore at 350 to 400 feet. The possibility of much water at that depth, the high royalties asked by lessors, and the decline in prices of lead and zinc early in 1926 caused most of the operators to either cancel their leases or postpone further drilling. The new area will be thoroughly prospected when the ore at the upper levels in the old productive areas becomes scarcer.

The success of the Liza Jane mine in working ore bodies found at 300 to 325 feet west of Baxter Springs caused extensive drilling north, south, and west of that mine. Frank E. Weeks sank one shaft on the Franklin lease and the St. Louis Smelting & Refining Co., Commerce Mining & Royalty Co., Federal Mining & Smelting Co., Athletic Mining & Smelting Co., and other operators also found the lower ore body by drilling. If this lower deposit proves equal to that being mined at the Liza Jane, large ore bodies will be added to former reserves. The lower ore was first found and worked at the Hartley mine, now operated by the Hutcheon Management Co., and the drilling has extended several miles west and north. Some drilling is also being done on the Goodwin and Harvey land east of

Baxter Springs. A little west of Blue Mound some lower ore bodies have been found. Virtually all land in the vicinity of Baxter Springs has been leased, and a considerable part of it is being rapidly drilled.

Most of the output in 1925, as in 1924, came from mines north and northwest of the Picher area and close to the State line, and mines north of Hockerville and east and north of Blue Mound produced 3,371 tons more lead than in 1924, and 5,295 tons more sphalerite concentrates in 1925 than in 1924.

The shipments of concentrates from the Blue Mound-Baxter area in 1924 amounted to 21,481 tons of galena and 174,581 tons of sphalerite; in 1925 they were 27,051 tons of galena and 200,043 tons of sphalerite. The average lead content of the galena sold was 78.8 per cent, and the zinc content of the sphalerite concentrates sold was 58.9 per cent. The crude ore ("dirt") milled yielded 6.53 per cent in concentrates, and at some mines the recovery was more than 10 per cent. Of the total zinc shipments 82 per cent came from mines west and northwest of Blue Mound. About 78 per cent of the lead shipped from the district came from mines west and northwest of Blue Mound.

The producing properties in the area west and northwest of Blue Mound were the State Line Zinc Co. (Blue Diamond), Blue Mound (Century Zinc Co.), Grace B (Consolidated), Wilbur, Northern (Childress), Vinegar Hill (Barr), Webber, West Side, Early Bird, Southern, Tar Creek, Childress (Wade), Chubb, Tulsa Quapaw, Cherokee, Lucky Jew mine of Eagle Picher, Black Eagle No. 2, Kansouri (Federal), Fox, Bendelari, Tom Brown, Lawyers, Boska, King Brand, Muncie, and Jarrett (Federal). The producing properties north of Hockerville and Zincville and east and north of Blue Mound were the Brewster, Commonwealth No. 2, Cherokee, Euterpe, Hartley (Hutcheon), Baxter, Sunshine (now Chicago No. 3), Empire, New Racetrack, Barnsdall No. 5, Liza Jane, Kansas Line, Homestake (Federal), Brugger (Vantage), Brewster (Barnsdall No. 6), and Monarch.

New concentrating plants were erected by the following: Century Zinc Co. (Blue Mound mill, 500 tons); Commerce Mining & Royalty Co. (Wilbur mill, 300 tons); Kansas Exploration Co. (Robinson mill, 250 tons); Euterpe Mining Co. (replacing mill burned in 1925); Vantage Mining Co. (No. 4 mill, 200 tons); and Underwriters Land Co. (Stebbins mill, 350 tons). In 1925 new flotation plants were installed at the following mines: Northern, Early Bird, Robinson, Wade, Queen Esther, Boska, Jarrett, Muncie, and Underwriters No. 7.

The Barr, West Side, Webber, Southern, Vantage No. 2, Grace B, Baxter, Tar Creek, Liza Jane, King Brand, Kansas Exploration, Blue Diamond, Southern, Lawyers, Black Eagle, Muncie, Tulsa Quapaw, and Early Bird mines each shipped more than 500 tons of galena in 1925.

The mines that shipped more than 3,000 tons of sphalerite in 1925 were the Barr, West Side, Webber, Wilbur, Grace B, Liza Jane, Hartley, Southern, Wade, King Brand, Boska, Lucky Jew, Queen Esther, Black Eagle, Cherokee, Chubb, Brewster, Muncie, Lawyers, Bendelari, Early Bird, Homestake, Kansas Exploration (Jarrett), Kansouri (Federal), and Tulsa Quapaw.

The Hartley mine near Baxter was sold to the Hutcheon Management Co. and the Crescent mine was taken over by the Childress Lead & Zinc Co. The Big Elk mill was burned and the mine was leased to C. Y. Semple, who operates it with the Early Bird. The Tulsa Quapaw mine and mill were sold to the Consolidated Lead & Zinc Co., which also took over the Stebbins mine of the Underwriters Land Co.

The Sunshine (Lucky OK) is now owned by the New Chicago Mining Co. and the Ebenstein land is under option to the Boska Mining Co.

KENTUCKY

By J. P. Dunlop

Lead and zinc deposits occur in both central and western Kentucky. None of the mines in the central districts reported any shipments of lead or zinc concentrates in 1925. The deposits in the fluorspar region of western Kentucky are chiefly in Crittenden, Caldwell, and Livingston Counties, and form a continuation of those in the southern Illinois lead and zinc region.

Considerable quantities of galena ores have been produced in former years, but at present lead is obtained solely as a by-product in the recovery and concentration of fluorspar, which is the principal economic mineral. The galena recovered is argentiferous, and its silver content ranges from a very small quantity to more than 3 ounces a ton, but no recovery of this silver content has been reported by the smelters during the last 14 years.

Mine production of lead and zinc in Kentucky, 1907–1925

Year	Lead concentrates (galena)		Zinc concentrates				Metal content			
			Sphalerite		Zinc carbonate		Lead		Zinc	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1907–1915	709	$31,602	723	$31,717	4,909	$160,669	480	$44,390	2,040	$342,886
1916	227	16,868	125	6,407	2,923	126,875	153	21,114	1,096	293,728
1917	184	15,415	------	------	2,299	78,368	123	21,156	751	153,204
1918	255	21,066	------	------	927	30,390	185	26,270	315	57,330
1919	120	7,250	------	------	120	3,600	86	9,116	36	5,256
1920	172	12,295	------	------	25	750	122	19,520	9	1,458
1921	100	3,693	------	------	621	19,800	69	6,210	220	22,000
1922	132	8,365	------	------	419	8,373	92	10,120	142	16,188
1923	78	6,152	------	------	850	17,925	53	7,420	270	36,720
1924	259	22,908	------	------	1,494	37,000	175	28,000	492	63,960
1925	251	23,619	------	------	1,217	29,740	152	26,448	429	65,208

The average lead content of galena concentrates in 1925 was 61.7 per cent. The total value of the lead and zinc concentrates shipped from Kentucky mines was $53,359, against $59,908 in 1924.

The principal sellers of galena concentrates were the Franklin Fluorspar Co., Eagle Fluor Spar Co., and the Keystone Fluorspar &

Lead Co. The Zinc & Spar Co. operated the Hudson mine, near Salem, Livingston County. The zinc carbonate ore came from workings 95 to 150 feet in depth and was treated in log washers and by jigs and tables before shipment.

MICHIGAN

By H. M. Meyer

PRODUCTION

The smelter production of refined copper in Michigan decreased from 145,333,227 pounds in 1924 to 138,029,764 pounds in 1925, whereas the mine production increased from 135,662,605 pounds in 1924 to 155,157,488 pounds in 1925. The difference between the mine and the smelter production is due to the fact that the quantity of concentrates or "mineral" produced is not the same as the quantity smelted. A company may produce either more or less "mineral" than it smelts during a year.

Mine production of silver and copper in Michigan, 1921–1925 [1]

Year	Silver (fine ounces)	Copper			Concentrate ("mineral")		Ore ("rock") (short tons)
		Pounds	Yield		Pounds	Yield (per cent)	
			Pounds per ton of ore ("rock")	Percentage			
1921	310,727	[2] 86,370,028	23.9	1.19	[3] 148,024,931	58.4	[4] 3,610,648
1922	376,990	[2] 121,712,365	24.6	1.23	[3] 193,984,975	62.7	[4] 4,952,264
1923	223,997	[2] 138,304,080	25.8	1.29	[3] 220,055,091	62.8	[4] 5,363,160
1924	130,381	[2] 135,662,605	25.3	1.26	[3] 213,779,365	63.5	[4] 5,372,572
1925	139,499	[2] 155,157,488	22.0	1.10	[3] 241,056,386	64.4	[4] 7,036,751

[1] The figures are based on the actual recovery of copper from "mineral" smelted and the estimated recovery from "mineral" that was not smelted during the year.
[2] Includes copper from sands.
[3] Includes "mineral" from sands.
[4] Includes sands.

Value of silver and copper produced in Michigan mines, 1921–1925

Year	Silver	Copper		Total
		Total	Per ton of ore ("rock")	
1921	$310,727	$11,141,734	$3.09	$11,452,461
1922	376,990	16,431,169	3.32	16,808,159
1923	183,678	20,330,700	3.79	20,514,378
1924	87,355	17,771,801	3.31	17,859,156
1925	96,812	22,032,363	3.13	22,129,175

The mines of the Calumet & Hecla Consolidated Copper Co. in 1925 produced 64,250,000 pounds of copper at an average cost sold, but not including depreciation or depletion, of 11.26 cents a pound. During the year the reclamation plants at Lake Linden and Hubbell produced 26,957,000 pounds of copper at an average cost sold of 7.06 cents a pound. The average price received for copper delivered was 14.23 cents a pound. The Calumet and Hecla reclamation plant at Lake Linden produced 20,278,000 pounds of refined copper from 2,125,000 tons of sand, and the Tamarack reclamation plant produced 6,679,000 pounds of refined copper from 606,605 tons of sand. The new railroad from the Ahmeek mine to the Ahmeek mill was completed; it went into operation early in September. Dividends totaling $1.50 a share were paid during 1925.

The Isle Royale Copper Co. treated 378,459 tons of rock and produced 9,543,000 pounds of refined copper, 25.22 pounds of refined copper to a ton of rock, compared with 315,507 tons of rock, and 8,103,000 pounds of refined copper, 25.68 pounds to a ton, in 1924. The company paid $1 a share in dividends in 1925.

The Baltic, Champion, and Trimountain mines produced 23,277,718 pounds of refined copper in 1925, of which 14,298,916 pounds were for the Copper Range Co., one-half of Champion's production belonging to St. Mary's Mineral Land Co. The rock stamped amounted to 591,068 tons; the average yield was 39.38 pounds of copper to a ton, compared with 40.80 pounds in 1924. During the six years, 1920–1925, the Baltic and Trimountain mines have run at a loss, but in every year, except 1920, the profits of the Champion mine and the railroad have resulted in a net operating profit for the Copper Range Co. This company paid dividends totaling $394,727 in 1925.

At the Mohawk mine 640,069 tons of rock were stamped in 1925; 22,698,300 pounds of mineral and mass were produced, which yielded 15,819,922 pounds of refined copper, a recovery of 24.716 pounds of copper from each ton of rock stamped. At the Wolverine mine 43,663 tons of rock were stamped; 796,700 pounds of mineral and mass were produced which yielded 574,084 pounds of refined copper, a recovery of 13.148 pounds to the ton. The mineral in the Wolverine mine is practically exhausted according to the company's report, from which the following historical summary is taken:

> This mine was operated from January, 1882, to November, 1884, and laid idle until August, 1890, having produced up to this time 1,979,378 pounds of copper. From August 1, 1890, to April 1, 1925, there were stamped 8,468,263 tons of rock from which 186,817,719 pounds of copper were recovered, which amounts to 22.06 pounds of copper per ton of rock stamped.

The Mohawk Mining Co. in 1925 paid four dividends totaling $460,000.

In 1925 the Quincy Mining Co. produced 586,913 tons of copper rock and mass, which yielded 24.46 pounds of refined copper per ton, a total of 14,357,523 pounds of refined copper. The mine produced virtually the same tonnage of copper rock as in 1924 but the slightly lower yield caused a decrease of about 480,000 pounds in the output of refined copper. The 139,499 ounces of silver produced by this mine represented the only silver produced by Michigan copper mines in 1925.

MISSOURI

By J. P. Dunlop

PRODUCTION

The value of the mine production of silver, copper, lead, and zinc in Missouri in 1925 was $39,120,728, compared with $32,161,663 in 1924. The value of copper decreased $22,230, and that of silver, $11,637; the value of lead increased $6,423,844, and that of zinc $569,088. The lead content of Missouri lead concentrates sold in 1925 was equivalent to 32.3 per cent of the smelter production in the United States of primary lead derived from domestic ores, compared with 33.5 per cent in 1924, and the zinc content of Missouri zinc concentrates sold in 1925 was 2.7 per cent of the primary zinc produced by smelters from domestic ores in 1925, as against 22.7 per cent in 1917. About 80 mines and prospects in Missouri shipped lead or zinc concentrates in 1925.

Mine production of copper and silver in Missouri, 1910–1925

Year	Copper		Silver		Lead concentrates, silver bearing (short tons)
	Pounds	Value	Fine ounces	Value	
1910–1918	3,527,293	$667,666	510,920	$333,582	495,823
1919	1,617,200	300,799	[1] 90,401	101,249	81,000
1920	1,512,539	278,307	[2] 111,128	121,130	90,000
1921	137,591	17,749	69,902	69,902	44,000
1922	797,400	107,649	212,656	212,656	138,000
1923	202,556	29,776	177,270	145,361	118,000
1924	182,811	23,948	103,694	69,475	90,000
1925	12,100	1,718	83,340	57,838	89,000

[1] Includes 29,480 ounces of silver from cobalt-nickel-copper ore.
[2] Includes 28,664 ounces of silver from cobalt-nickel-copper ore.

The silver content of the lead ores is so small that it is disregarded in the assay and sale of the concentrates. For this reason the smelter reports must be relied on for the silver production. As may be seen by inspection of the table, the quantity of silver produced in any year bears no direct ratio to the quantity of lead concentrates smelted during that year, because the silver content is so small that the silver bullion is stored and refined in batches. Over a series of years the concentrates average more than 1 ounce of silver to the ton.

No copper was derived from matte recovered in smelting lead ores, and the small quantity of copper shown came from the Shawnee mine near Eminence.

The value of the metallic content of the lead and zinc concentrates produced in Missouri in 1925 was $39,061,172, an increase of $6,992,932 over the value for 1924. The production of lead concentrates (of which all but 386 tons was galena) was 317,972 short tons, as

compared with 295,604 tons in 1924. Of the output in 1925, 314,403 tons was derived from southeastern and central Missouri, an increase of 21,799 tons. The average metal content of the lead concentrates from these districts was 67.6 per cent in both 1924 and 1925, and the value per ton in 1925 was $100.91 as compared with $84.55 in 1924. The quantity of lead in southeastern and central Missouri concentrates in 1925 amounted to 208,915 tons, an increase of 21,178 tons.

Shipments of galena concentrates from southwestern Missouri were 3,183 tons, compared with 2,718 tons in 1924. The lead carbonate concentrates amounted to 386 tons, an increase of 104 tons. The quantity of lead from southwestern Missouri, or the Missouri part of the Joplin region, was 2,651 tons, an increase of 459 tons. The average metal content of the galena concentrates from southwestern Missouri was 76.8 per cent, and the average value per ton was $110.51, or $9.20 more than in 1924.

The quantity of zinc-blende concentrates sold from Missouri mines was 26,187 tons, an increase of 2,926 tons compared with 1924. All the blende concentrates were produced in southwestern Missouri. The average value received was $54.18 a ton, and the average zinc content reported by the sellers was 60.8 per cent, as compared with $41.91 and 60.7 per cent in 1924.

The zinc carbonate and silicate concentrates sold amounted to 2,269 tons, or 816 tons more than in 1924. The output came entirely from southwestern Missouri. The average metal content of the zinc carbonate and silicate concentrates was 38.2 per cent, and the average value per ton was $30.80, compared with $24.29 in 1924.

The value of lead concentrates from southeastern and central Missouri (which produced about 99 per cent of the lead concentrates) was $31,727,170, or $6,987,351 more than in 1924. The total value of the lead and zinc concentrates from southwestern Missouri was $1,873,432, compared with $1,307,620 in 1924.

The total quantity of crude ore or "dirt" mined and treated in Missouri in 1925 was 6,872,000 short tons. As the total amount received for all classes of lead and zinc concentrates sold in 1925 was $33,600,602, the average value per ton of crude ore or "dirt" mined and treated was $4.89.

In the following tables, showing the tenor of crude ore ("dirt") and concentrates from Missouri, it has been considered advisable to segregate the ores of different nature. The disseminated lead ore of southeastern Missouri differs radically from the lead and zinc ores of the so-called "soft ground" deposits of southwestern Missouri. Each class of ore has its peculiar problems of mining and ore dressing. The data are given for the ores mined in the Joplin region, but there have been no recoveries from "sheet ground" since 1921. In general, the tables reflect very closely the conditions of the industry.

Mine production of lead and zinc in Missouri in 1925, by districts

District	Lead concentrates				Zinc concentrates			
	Galena		Carbonate		Sphalerite		Silicate and carbonate	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Carthage	25	$2,600			171	$6,929		
Duenweg-Porto Rico	385	45,162			413	20,657	450	$14,000
Granby	473	48,435			1,000	49,095	954	29,296
Joplin and Smithfield	1,169	130,733	277	$23,510	8,541	456,262	390	12,100
Oronogo	184	19,210			127	4,126	2	55
Sherwood-Thoms Station	28	3,242			1,275	58,666		
Spring City-Spurgeon	254	27,749	109	9,581			428	13,023
Webb City-Carterville-Prosperity	492	57,669			157	6,489		
Wentworth					43	2,408		
Waco	151	14,526			12,211	679,956		
Ozark, Barry, and Hickory Counties	22	2,422			2,249	134,131	45	1,400
	3,183	351,748	386	33,091	26,187	1,418,719	2,269	69,874
Southeastern Missouri	314,403	31,727,170						
Total, 1924	317,586	32,078,918	386	33,091	26,187	1,418,719	2,269	69,874
	295,322	25,015,184	282	22,196	23,261	974,765	1,453	35,294

District	Metal content [1]			
	Lead		Zinc	
	Short tons	Value	Short tons	Value
Carthage	20	$3,480	83	$12,616
Duenweg-Porto Rico	295	51,330	358	54,416
Granby	362	62,988	820	124,640
Joplin and Smithfield	1,042	181,308	4,720	717,440
Oronogo	144	25,056	57	8,664
Sherwood-Thoms Station	22	3,828	663	100,776
Spring City-Spurgeon	261	45,414	143	21,736
Webb City-Carterville-Prosperity	374	65,076	73	11,096
Wentworth			22	3,344
Waco	113	19,662	6,609	1,004,568
Ozark, Barry, and Hickory Counties	18	3,132	1,246	189,392
	2,651	461,274	14,794	2,248,688
Southeastern Missouri	208,915	36,351,210		
Total, 1924	211,566	36,812,484	14,794	2,248,688
	189,929	30,388,640	12,920	1,679,600

[1] In calculating the metal content of the ores from assays allowance has been made for smelting losses of both lead and zinc. In comparing the values of ore and metal it should be borne in mind that the value given for the ore is that actually received by the producer, whereas the value of the lead and zinc is calculated from the average price for all grades.

Tenor of crude lead and zinc ore and concentrates produced in southwestern Missouri, 1923–1925

	1923	1924	1925
Total crude ore, short tons	784,000	459,100	662,200
Total concentrates in crude ore:			
Lead, per cent	0.4	0.65	0.54
Zinc, do	4.58	5.38	4.30
Metal content of crude ore:			
Lead, do	.3	.49	.41
Zinc, do	2.65	3.20	2.54
Average lead content of galena concentrates, do	75.6	76.1	76.8
Average lead content of lead carbonate concentrates, do	60.2	60.0	60.0
Average zinc content of sphalerite concentrates, do	60.0	60.7	60.8
Average zinc content of silicates and carbonates, do	38.6	39.3	38.2
Average value per ton:			
Galena concentrates	$83.40	$101.31	$110.51
Lead carbonate concentrates	69.60	78.71	85.73
Sphalerite concentrates	40.52	41.91	54.18
Zinc silicates and carbonates	26.57	24.29	30.80

Tenor of crude lead ore and concentrates in southeastern Missouri disseminated-lead district, 1923–1925

	1923	1924	1925
Total crude lead ore, short tons	5,314,900	6,059,700	6,209,800
Galena concentrates in crude ore, per cent	4.88	4.83	5.06
Lead content of crude ore, do	3.21	3.26	3.43
Average lead content of galena concentrates, do	65.9	67.6	67.6
Average value per ton of galena concentrates	$74.94	$84.55	$100.91

Mineral Resources for 1914, Part I, pages 72 to 77 and 97 to 100, gave a brief history of lead and zinc mining in the southeastern Missouri and Joplin regions, also data relating to the total lead and zinc production, the mining and milling practice, the character of the ore and concentrates, and the methods of selling them.

SOUTHWESTERN MISSOURI

AREA AND PRODUCTION

The southwestern Missouri lead and zinc areas include the largest part of the Joplin region, the remainder lying in southeastern Kansas and northeastern Oklahoma.

Lead and zinc concentrates produced in the Missouri part of the Joplin region, 1907–1925

	Short tons	Value	
		Total	Average
Lead concentrates	450,446	$28,855,885	$64.06
Sphalerite concentrates	2,825,060	143,916,560	50.94
Zinc carbonate and silicate concentrates	298,777	9,243,981	30.94
	3,574,283	182,016,426	

PRICES

The following quoted base prices apply not only to southwestern Missouri, but also to all the mines in Oklahoma and Kansas that are in the Joplin region. The average quoted base prices for 60 per cent sphalerite were highest during November, 1925.

The quoted prices were $56 to $58 early in January, but slumped as low as $50 at the end of the month. February brought a stronger market and prices advanced, first to $52.50 and then to $54. The March prices were $52 to $53. Early in April there was a decline to $50, then to $47.50. In May the price rose to $49.50 and June prices were about the same as the May. In August prices were up to $53 and $55 and in September to $54 to $55. There was a steady advance in October, when $58 was quoted and paid. In November the market was steady at $58 to $59. Lower prices prevailed in December, and $56 was the closing quotation.

No base prices were quoted for calamine or zinc silicate in 1925, and there was little demand for these ores. The output increased slightly in 1925 and was mainly sold in small lots. Nearly all was from lessees on Granby land milled at the American mill and at mills near Joplin, including Buxton and Durfee. If more zinc silicate was produced it would be in more active demand. Carload lots are desired and it is not easy to sell chunk zinc silicate.

The quoted price for galena carrying 80 per cent of lead showed wide variations, from a high of $145 to $146 a ton during the first two weeks in January to a low of $90 to $95 in May. The price of galena was unsteady at $125 to $146 a ton during January. It declined to $115 a ton in February and to $107.50 a ton in March. Early in April the price declined to $100 and reached $90 a ton late in April and in the first two weeks of May. At the end of May it advanced to $105 and in June to $110. In July the market weakened to $100 then advanced to $110 about the first of August. In August prices continued to advance, reaching $130 before the end of the month. At the end of September lead ore sold for $115, in October it brought $120, and it continued to advance during the first two weeks of November, reaching $130. The price the last two weeks in November was $125. It declined to $115 early in December and remained steady until the end of 1925.

Average prices per ton paid for sphalerite and zinc and lead concentrates in southwestern Missouri, 1917–1925

	1917	1918	1919	1920	1921	1922	1923	1924	1925
Sphalerite	$71.04	$51.27	$40.67	$45.79	$25.18	$31.91	$40.52	$41.91	$54.18
Zinc silicate or carbonate concentrates	40.50	32.27	27.30	35.50	10.57	21.25	26.57	24.29	30.80
Galena concentrates	101.90	89.92	66.82	97.84	50.15	69.44	83.40	101.31	110.51

These prices are not average of base-price quotations but averages calculated from the quantity sold and the amounts received as reported by the sellers.

GENERAL CONDITIONS

The much higher average prices for lead and zinc concentrates in 1925 did not result in any large increase in the mine output of the Missouri part of the Joplin region. Some new properties were worked but the output from the Missouri part of the Waco district decreased. In southwestern Missouri there was an increase of 465 tons of galena, 104 tons of lead carbonate, 2,926 tons of sphalerite, and 816 tons of zinc silicate and carbonate. A steady drilling campaign was conducted in many of the old camps and in new undeveloped territory, especially by the Kansas Exploration Co., St. Louis Smelting & Refining Co., Victor Rakowsky, and Federal Mining & Smelting Co. Much drilling was done at Granby, Smithfield, Waco, Thoms Station, Spring City, and other districts and some good bodies of ore are reported found.

Leasing was very active. Several new mills began work; others were being constructed and will be running in 1926. On the whole, however, the output from southwestern Missouri will not increase much in 1926 even if the high price for ore continues. Several smelting interests, such as the Universal Exploration Co., Grasselli Mining Corporation, Kansas Exploration Co., Eagle-Picher Lead Co., and Matthiessen & Hegeler are now operating mills in Missouri and have leased large areas of land.

The Missouri part of the Waco district produced only about 47 per cent of the sphalerite shipped from Missouri in 1925, against about 90 per cent in 1924. The mines at Waco, in Missouri only, that contributed the 12,211 tons of sphalerite and 151 tons of galena were those of the Barnsdall Zinc Mining Co. (No. 2), American Zinc, Lead & Smelting Co., Freehold No. 4, Universal Exploration Co., Tulsa Pittsburg Mining Co., and the Lihme Zinc Co. The Universal Exploration Co. purchased and equipped the old Gascho mine, Freehold No. 4 was under option to the St. Louis Smelting & Refining Co., and the Lihme Zinc Co. took over and consolidated the Allegheny Western, Blue Rock, Freehold Nos. 2 and 3, and the Pyramid mines. Both the Universal and the Lihme were active during only the last few months of 1925. No mining was done in the Sarcoxie-Reeds, Alba-Neck City, Aurora, or Cave Springs districts, but the Grasselli Mining Co. prepared to unwater the old mines at Neck City and the Aurora Mines Corporation leased and drilled old properties at Aurora.

At Wentworth the Barbo Mining Co. reconstructed a mill of 200 tons and made one shipment of lead-free sphalerite, and the Eagle-Picher Lead Co. did some drilling and sunk a shaft at the Navy Bean mine. Only scrapping and drilling were done in the old Webb City-Carterville and Oronogo camps, and a few carloads of sphalerite concentrates were shipped from Carthage from the Lucky Eleven mine before the concentrating plant burned. The Rogers Mining Co. built a new mill south of Carthage, but did not operate it in 1925. In the Spurgeon-Spring City camps the production was scattered and small. The Eagle Picher Mining Co. worked the Velton mine near Bryceville, Barry County, during a large part of the year, producing very high grade blende from sheet ground at the 70-foot level. Drilling was very active in the vicinity of Duenweg-Porto Rico, but

the only producers of any importance were the Log Cabin Mining Co., which yielded galena concentrates only, and the S. & M. Mining Co., which produced small quantities of blende, galena, and zinc silicate. A considerable number of small leases on the Granby land of the American Zinc, Lead & Smelting Co. yielded lead and zinc concentrates. The Federal Mining & Smelting Co. leased a large part of the Granby land and built a 400-ton concentrating plant that was operated late in December, 1925, though no concentrates were shipped. This plant, one of the best in Missouri, is supplied with ore from different levels of the old Klondike, Mascot, and other mines.

Only a few mines were active near Joplin in 1925 and a large part of the galena and zinc silicate was produced in small lots by miners working in old areas. The largest output of sphalerite was that of the Isherwood mine of the Kansas Exploration Co., which operated four shafts at levels about 140 feet deep. The mill, which has a capacity of 250 tons in 10 hours, was the largest producer of zinc concentrate in Missouri in 1925. The C. & S. Mining Co. (old Imperial) operated a 250-ton mill near the Kansas-Missouri State line which yielded good outputs of both lead and zinc. Two shafts 160 feet deep were used to hoist ore, and many improvements were made in the equipment. Other new producers near Joplin in 1925 were the Commercial Metal Mining Co. near Fillmore's bridge and the Missouri Mining Co. on American Zinc, Lead & Smelting Co. land. The Buxton-Durfee mill at Joplin ran part time on purchased ore and concentrates, and the Clark Concentrating Co. continued to re-treat old slag at the Eagle-Picher Lead Co. dump.

Drilling and development were done and a shaft was sunk at the Black Cat mine near Smithfield, but the mill was not finished until 1926. On the Alamo land at Thoms Station the Admiralty Zinc Co. built a new 200-ton mill, which began running in the fall of 1925 on ore at 160 to 190 feet. The Billy B Mining Co. made a fair output before being closed down.

New mills were also under construction near Thoms Station by the Grasselli Mining Corporation on Mexico-Joplin land and by the Matthiessen & Hegeler Mining Co. on the old Napoleon and other leases; both of these mills are running in 1926. The only output for Hickory County was a few tons of galena, sold by J. G. Westerman, and the only shipments from Ozark County were some galena and zinc silicate from the Bain & Page land.

CENTRAL AND SOUTHEASTERN MISSOURI

A brief description of the ore deposits in central and southeastern Missouri is given in the chapter of Mineral Resources entitled "Silver, copper, lead, and zinc in the Central States in 1915."

Copper, nickel, and cobalt occur in the ore in considerable quantity near Fredericktown and in small quantity irregularly in nearly all deep mines. It is only near Fredericktown that the copper, nickel, and cobalt content of the ore has been the object of mining, yet a concentrate of these metals has been recovered as a table middling at several plants in other parts of the district.

In the disseminated-ore district the production increased rapidly after 1869 and is estimated by Buckley to have amounted to 1,202,607 tons of lead concentrates, valued at $59,869,354, for the period between 1869 and 1906, inclusive. The mine production of southeastern and central Missouri has been reported annually since 1907.

Mine production of lead and zinc concentrates in southeastern and central Missouri, 1907–1925

Year	Lead concentrates (galena)		Zinc concentrates			
			Sphalerite		Carbonate and silicate	
	Short tons	Value	Short tons	Value	Short tons	Value
1907–1915	1,945,996	$85,207,971	452	$13,108	8,435	$168,929
1916	307,025	20,720,737	365	14,400	1,030	42,129
1917	306,473	30,070,995	186	16,344	293	7,145
1918	271,506	20,507,064	13	285	235	6,845
1919	229,687	11,590,977	----	----	231	6,576
1920	242,248	19,799,389	----	----	61	1,910
1921	280,358	11,737,400	----	----	----	----
1922	271,294	14,779,869	----	----	----	----
1923	259,320	19,434,633	----	----	----	----
1924	292,604	24,739,819	----	----	----	----
1925	314,403	31,727,170	----	----	----	----

The output of silver in Missouri in 1925, except 6 ounces from copper ore, was derived from refining pig lead. The silver was recovered from about 89,000 tons of lead concentrates.

The crude lead ore mined in the disseminated-lead district, amounting to 6,209,800 short tons, yielded 5.06 per cent of lead concentrates which averaged 67.6 per cent of lead. The average value per ton of lead concentrates was $100.91, compared with $84.55 in 1924. The output of galena concentrates was 314,276 tons, against 292,487 tons in 1924. As several of the large producers not only mine but also smelt their lead concentrates, the values given for concentrates are to a certain extent arbitrary. The galena concentrates produced in the southwestern Missouri region, which contain a higher lead content, are sold mainly on bids from purchasers, and the values for those concentrates are not comparable with values given for concentrates of the disseminated-lead district.

Analyses of ores mined in the disseminated-lead district in southeastern Missouri and of the various grades of resulting concentrates are given in Mineral Resources for 1919 and 1920.

There were no shipments of zinc carbonate from southeastern Missouri during the year.

The quantity of galena recovered from shallow diggings in Washington and Jefferson Counties was only 127 tons. The ore, which occurs at shallow depths in association with barite, is mined in a small way and at odd times by the barite miners.

Considerable drilling was done by Rakowsky and Naething in southeastern Missouri and some diamond drilling in Camden County. Nixon-Thompson have a large area of land under lease near Lynn

Creek on which some drilling was done and a number of shallow shafts were sunk. The ore mined was placed on the dump, and none was sold in 1925.

Small sales of lead ore were made by P. G. Higginbotham, of Fertile, the Washington Land & Mining Co., National Pigments & Chemical Co., and the Valle Mining Co. Nearly all the lead produced in southeastern Missouri was mined by the National Lead Co., St. Joseph Lead Co., Desloge Consolidated Lead Co., and Annapolis Lead Co.

In 1925 the St. Joseph Lead Co., from mines in southeastern Missouri, produced about 4,630,000 tons of crude ore, which yielded 247,000 tons of lead concentrates, and the smelter produced about 169,000 tons of pig lead. The St. Joseph Lead Co. now has five concentrating plants: Rivermines, 4,200 tons; Bonne Terre, 2,400; Leadwood, 2,000; Flat River, 5,000; and Elvins, 3,000. Shafts Nos. 9 and 10 were closed and shafts Nos. 1 and 11 were opened in 1925. Other concentrating plants are those of the National Lead Co., 2,500 tons, and the Desloge Consolidated Lead Co., 1,500 tons. Besides operating in southeastern Missouri, the St. Joseph Lead Co., through a subsidiary, has done a large amount of drilling in the Joplin region, operated two plants and was building others.

The Annapolis Lead Co's. mine in Iron County was worked through the 450-foot shaft until the milling plant, which had a daily capacity of 600 tons, was badly damaged by a cyclone in March, 1925. It has been idle since, although efforts are being made to reorganize the company. A new crushing plant was added to the mill of the Desloge Consolidated Lead Co., which in 1925 worked three shafts averaging 365 feet in depth.

OKLAHOMA

By J. P. Dunlop

Mine production of lead and zinc in Oklahoma in 1925, by districts

District	Lead concentrates (galena)		Zinc concentrates (sphalerite)		Metal content [1]			
					Lead		Zinc	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Miami	100, 765	$11, 797, 116	526, 688	$26, 637, 198	78, 006	$13, 573, 044	271, 815	$41, 315, 880
Quapaw and Sunnyside	2, 594	308, 978	22, 523	1, 172, 383	1, 940	337, 560	11, 556	1, 756, 512
	103, 359	12, 106, 094	549, 211	27, 809, 581	79, 946	13, 910, 604	283, 371	43, 072, 392
Total, 1924	91, 882	9, 801, 526	516, 228	21, 127, 909	71, 358	11, 417, 280	269, 137	34, 987, 810

[1] In calculating the metal content of the ores from assays allowance has been made for smelting losses of both lead and zinc. In comparing the values of ore and metal it should be borne in mind that the value given for the ore is that actually received by the producer, whereas the value of the lead and zinc is calculated from the average price for all grades.

The following table gives the output of crude lead and zinc ore for the whole State of Oklahoma:

Tenor of lead and zinc ore and concentrates produced in Oklahoma, 1923–1925

	1923	1924	1925
Total crude ore milled in Oklahoma ..... short tons	7,937,200	8,804,000	10,605,200
Total concentrates in crude ore:			
Lead ..... per cent	1.08	1.04	1.01
Zinc ..... do	5.61	5.76	5.13
Metal content of crude ore:			
Lead ..... do	.86	.83	.80
Zinc ..... do	3.34	3.41	3.01
Average lead content of galena concentrates ..... do	79.9	79.2	78.9
Average zinc content of sphalerite concentrates ..... do	59.5	59.2	58.6
Average value per ton:			
Galena concentrates	$94.95	$106.68	$117.13
Sphalerite concentrates	40.45	40.93	50.64

Mine production of lead and zinc concentrates in Oklahoma, 1891–1925, by districts

District	Lead concentrates (mainly galena)		Zinc concentrates			
			Sphalerite		Zinc silicate and carbonate	
	Short tons	Value	Short tons	Value	Short tons	Value
Peoria	2,178	$107,053	220	$8,289	2,842	$74,402
Quapaw and Sunnyside	7,951	697,764	68,827	3,137,296	164	2,692
Miami	717,658	63,477,052	3,487,618	151,960,613		
Davis			558	27,399	899	24,592
	727,787	64,281,869	3,557,223	155,133,597	3,905	101,686

Mineral Resources for 1914 contains a brief history of mining in the districts in Oklahoma and also the estimated total production of each district, by years.

The total value of the lead and zinc concentrates shipped from Oklahoma in 1925 was nearly $9,000,000 more than in any previous year, and the value of the zinc was greater than the value of any one year's production of any State.

The lead and zinc deposits of northeastern Oklahoma, so far as known, are confined to Ottawa County and form the southwestern extension of the deposits in the Joplin region. There are three camps—Peoria, Quapaw-Sunnyside, and Miami—in which extensive mining has been done, and a fourth, the Sycamore Creek district, along the Seneca fault block 2 to 3 miles southwest of Seneca, Mo., in which considerable prospecting has been done and some ore mined. The lead and zinc deposits in southern Oklahoma are near Ravia, at the southeast end of the Arbuckle Mountains, and near Davis, Murray County, at the northwest end of the same range.

The quantity of crude ore milled in Oklahoma increased 1,801,200 tons in 1925, of which the quantity of ore milled by the old mines near Commerce and for mines near Quapaw and Sunnyside was

about 3 per cent. The value of the lead and zinc produced at mines in Oklahoma was $56,982,996, compared with $46,405,090 in 1924. The metal content of lead concentrates increased from 71,358 to 79,946 tons and the zinc from 269,137 to 283,371 tons.

The lead concentrates produced were of about the same grade as those shipped in 1924. The average metal content of the sphalerite concentrates from the Miami ore increased from 51.8 per cent in 1912 to 59.2 per cent in 1924, and decreased to 58.6 per cent in 1925.

The Oklahoma part of the Miami field produced about 76 per cent of the total output of lead concentrates in the Joplin region. The Oklahoma shipments of sphalerite increased 32,983 tons and formed about 68 per cent of the output of sphalerite from the Joplin region.

A history of the mining in the Miami district, including the output by years for 1908 to 1914 and the location of the mines and mills, was given in Mineral Resources for 1914. The reports for 1915 to 1924 contain full reviews of the production, new territory prospected, new mines opened, and new mills erected in those years. A brief description of the ore deposits in the Miami district is given in Mineral Resources for 1915.[4]

In 1925 about 135 mills in the Oklahoma part of the Miami field shipped 103,359 short tons of galena concentrates and 549,211 tons of sphalerite concentrates, an increase of 11,477 tons of galena concentrates and 32,983 tons of sphalerite concentrates compared with the output in 1924. The average value of the galena concentrates increased $10.45 a ton, and the average value of sphalerite concentrates, of which nearly five and one-half times as much was shipped, increased $9.71 a ton.

High prices for galena and sphalerite permitted the mining of ore that was developed at many mines but could not be profitably extracted in preceding years. The percentage of concentrates recovered was appreciably less than in 1924, the total quantity of crude ore milled increased 20 per cent and, as the average mill recovery increased at least 5 per cent in 1925, the ore milled likely had at least 1 per cent less concentrates in 1925 than in 1924. Considerable drilling outside the proved area disclosed new ore bodies of probable value west and east of territory now actively mined, especially between Quapaw and Lincolnville and the Kansas line where nearly every 40-acre tract has had one or more drills on it during 1925. Several new mills were erected in this area and a number of shafts sunk. Ore bodies were located in drilling many leases, and many leases were transferred. On the whole, the bodies of ore are narrower and shallower than in the main Miami district, and the mills and equipment are on a much smaller scale.

Some drilling was done on the western edge of the productive area and several new mines are being equipped with mills. The weekly output grew steadily in 1925 when it reached over 20,000 tons of concentrates. This output, however, was greater than consumption even though about 40,000 tons of concentrates were sold for export to Europe. There were no labor troubles, and the supply of labor was ample but not in excess of demand. In all, the Joplin

[4] Siebenthal, C. E., Zinc: U. S. Geol. Survey, Mineral Resources, 1915, pt. 1, 1917, pp. 888–890.

region enjoyed one of its most prosperous years; its record output sold at good prices and most operators made satisfactory profits.

The total quantity of crude ore milled in the Miami region in Oklahoma and Kansas in 1925 was about 14,086,000 tons. Each of 132 mines in this region made shipments of lead and zinc concentrates exceeding $100,000 in average value. There were more drill rigs and more shafts and milling plants in operation in this small area than in any other district in the United States. Comparatively few new mills were built, but recoveries of concentration were greatly increased by better mill equipment, more tables, and the general adoption of flotation for slimes. There are now about 100 flotation plants in the field. More attention was paid to possible changes in milling methods as suggested by Messrs. Coghill and Anderson of the Bureau of Mines. The quantity of flotation concentrates being produced at the end of the year was about 1,500 tons weekly. Selective flotation is gradually increasing and some galena concentrates from flotation plants contain 80 per cent lead and the sphalerite 58 to 60 per cent zinc. The use of filters has increased and the moisture in the flotation concentrates is now much less than formerly. The increase of flotation and the mixing of flotation with jig and table concentrates has lowered the metal content of the concentrates about 0.5 per cent.

Few mines were abandoned during the year, though many were thought to have nearly exhausted their ore bodies. By active prospecting most of the old properties found more ore or took up old stopes and discovered ore at lower levels. Many of the old mines and leases were optioned and drilled several times, and finally worked with success during the period of high prices for lead concentrates. Some ore was mined that carried less than 4 per cent in concentrates. Better milling methods and the general use of flotation have probably increased the recovery of concentrates from ore milled from 65 per cent to 75 and 85 per cent.

The large companies continued to expand their holdings and operations and the price of developed mines and working mills advanced sharply. Even though based on current earnings, the advance was too sharp to induce eastern capital to invest in developed properties, so that most of the mines or leases sold in 1925 were taken by operators of other mines in the district. Virtually all of the larger operating companies such as the Federal, Eagle Picher, Kansas Exploration, Golden Rod, Commerce, New Chicago, Vinegar Hill, Velie, American Zinc, Anna Beaver, and Admiralty increased their holdings.

Near Hockerville and Zincville.—The Wade lease optioned to Kansas Exploration Co., and part of the Weiss land with the Toltec mine was purchased by Dr. A. G. Hull. The Golden Rod Mining & Smelting Co. leased 180 acres of the Weiss land it had drilled, and is now sinking three shafts. The Eagle-Picher Lead Co. bought the Indiana mine and also leased the adjoining Melrose 40 acres. St. Louis mines 1 and 2 reverted to George W. Beck, who erected a 300-ton mill on the east side of the lease in 1925. The Blue Bonnett mine was taken over by the Commerce Mining & Royalty Co. Two shafts were sunk on the Dobson & Fullerton 80 acres near Hockerville, and the ore is being milled at the Dobson mill by the Federal

Mining & Smelting Co. The Van Buren Milling Co. is treating ore and tailings at the old Mogul mine. The Tulsa Lead & Zinc Co. is running two mills on the old West Virginia and Red Bird leases. The Blue Ribbon Lead & Zinc Co. acquired the Indian Queen mine lying north of the Blue Ribbon.

The Retriever Milling Co. erected a 200-ton plant to recover tailings at the St. Louis No. 2, and the Blue Bonnett tailings are being treated by Clarence Robinson & Co.

Near Quapaw and Sunnyside.—More drilling was done and more shafts were sunk in this area than in any other part of the Joplin region. The ore bodies are mainly shallow and small but are rich. The Century Zinc Co. erected a mill on the Malsbury lease and is mining the richest ore in the district. Neff & Cole, Universal Exploration Co., Century Zinc Co., Eagle-Picher Lead Co., and others did considerable drilling. Some of the producing mines in this area in 1925 were the Annex, Hope, Malsbury, Martha B, Mary Jane, Patty C, Wolverine, Vantage No. 2, Hobart, and Donna Jane. Mills were built at the Mary Jane, Patty C, Malsbury, Martha B, Hobart, American Prospecting, and Donna Jane. The Federal Mining & Smelting Co. took over all the leases of the Quapaw Mining Corporation in the Quapaw section and had many drill rigs busy during 1925. The ore from several leases is now being milled at the Wolverine mill. Some new operators in 1925 who sank shafts or built mills were Eleventh Hour Mining Co., Rialto Mining Co. (No. 2), Cortez King Brand Mining Co., and American Prospecting & Mining Co.

Near Century and Douthat.—Eighty-three per cent of the sphalerite and 85 per cent of the galena shipped from properties in this area were produced by the Underwriters Land Co. (two mills), New Chicago Mines Corporation (two mills), Admiralty Zinc Co. (three mills), Skelton Lead & Zinc Co. (three mills), Childress Lead & Zinc Co. (one mill). Other producing mines were Pat Mining Co., R. A. S. P. Mining Co. (old Missouri Mule), Ramage Mining Co., Advance Mining Co. (old Federal), Cortez King Brand Mining Co. (Bullfrog), Remnants (Inc.) (Quebec mine). Tailing mills active in 1925 were those of Tri State Development Co. (Skelton No. 8), Dudley Milling Co. (Admiralty lease), and Century Milling Co. (Montreal lease).

Near Cardin and Tar River.—This area in the Miami field had the largest number of operated mines and made the largest shipments of concentrates in 1925. The heaviest shippers were the Golden Rod Mining & Smelting Co. (five mills), Commerce Mining & Royalty Co. (eight mills), Bilharz Mining Co. (two mills), Oklahoma Woodchuck Zinc Lead Co. (one mill), Velie Mine Corporation (one mill), Anna Beaver Mine Co. (one mill), Rialto Mining Corporation (one mill), Domado Lead & Zinc Co. (one mill).

Other large producers of lead and zinc were Crystal Mineral Trust, Baby Jim Mining Co. (now Consolidated), Pioneer Mining Co., Jack & Jill Mining Co. (now Domado), Federal Mining & Smelting Co. (Lucky Bill), L. &. G. Mining Co. (Republic), Harrisburg Mining Co., Smith & Davis (Ritz), Vinegar Hill Zinc Co. (Wilson), Barnsdall Zinc Co. (Goodeagle), Quapaw Mining Corporation (Tom L.), Kitty Mining & Milling Co., Childress Lead & Zinc Co.

(Southside), American Zinc, Lead & Smelting Co., Tri State Mining Co., and the R. M. Clark (Bethel tailings). The Baby Jim mine was purchased by the Consolidated Lead & Zinc Co. and the Ritz mining lease was sold to the Kansas Exploration Co. after the Smith-Davis mill burned. The Pioneer mill burned but was rebuilt. The L. & G. Mining Co. took over the Republic and Manhattan mines and reconstructed the Republic mill. The Jack & Jill mine was bought by the Domado Lead & Zinc Co. and the S. S. & G. lease is under option to the American Zinc, Lead & Smelting Co. which is drilling the lower ground.

Near Picher.—From the area about Picher, which includes many of the older mines of the Miami district, the output of concentrates in 1925 was slightly less than in 1924 as the recovery was smaller. The largest shipper was the Eagle-Picher Lead Co. (seven mills). Other large shippers were the Acme Lead & Zinc Co., Laclede Lead & Zinc Co., Lead Boy Mining Co., Dorothy Bill Mining Co. (two mills), United Zinc Smelting Corporation (Royal), White Mines Co., Mahutske Mining Co., Lucky Kid Mining Co. (Whitebird, Keltner, and Beck leases), Commerce Mining & Royalty Co. (Grace Walker), Premier Zinc Co. (Premier and St. Joe), Federal Mining & Smelting Co. (three mills), Consolidated Lead & Zinc Co. (La Salle, Piokee, and Grace B No. 2), Vantage Mining Co., Birthday Mining Co. (Leonora), Howe Mining Co., Commonwealth Mining Co., St. Louis Smelting & Refining Co. (American Beauty), Oko Mine, Golden Rod Mining & Smelting Co. (Jefferson), Black Hawk Lead & Zinc Co., Cortez King Brand Mining Co. (New York).

The production of the Oklahoma part of the Miami field represented about 135 mills, of which 5 are in the old Commerce camp and the remainder in the territory extending north and northeast to the Kansas State line and east to Quapaw. In the northerly extension of the Miami field in Kansas about 47 mills were busy at different times in 1925. The quantity of crude ore mined and milled in Oklahoma increased from 8,804,000 tons in 1924 to 10,605,200 in 1925. The average metal content of the sphalerite was 51.8 per cent in 1912, 58.8 per cent in 1919, 59.2 per cent in 1924, and 58.6 per cent in 1925. The separate assays reported showed a zinc content of 47 to 62 per cent, but most of the blende assayed between 57 and 60 per cent. An assay of a composite sample of 9,876 samples of ore shipped in 1925 from the Miami-Blue Mound region, made by Bruce Williams, of Joplin, Mo., showed an average content of 58.40 per cent of zinc, 1.80 per cent of iron, 0.92 per cent of lead, and 0.42 per cent of cadmium. An assay of a composite sample of blende from 3,276 lots shipped in 1925, made by Joe J. Todd, of Miami, Okla., showed 59.1 per cent of zinc and 1.50 per cent of iron. An assay by Mr. Todd of a composite sample of galena from 528 lots showed 78.6 per cent of lead. The average zinc assay as computed from the reports of all the companies selling concentrates was 58.6 per cent.

The recovery of concentrates from all the mines in Oklahoma averaged about 1 ton of galena to 5.3 tons of sphalerite. The proportion of galena concentrates recovered from the "dirt" mined showed wide variations in different mines, ranging from less than 1 ton of galena to 50 tons of sphalerite to 2½ tons of galena to 1 ton of sphalerite. Only four mines reported the recovery of no lead.

The total shipments from those properties that may be properly classed as in the Tar River-Cardin-Douthat area, of which there were a greater number than in the other areas, amounted to 54,015 tons of galena and 278,413 tons of sphalerite, a large increase over that of 1924 although the percentage of concentrates recovered decreased from 6.84 to 6.29 per cent.

About 5,290,000 tons of "dirt" were milled, and the recovery in concentrates averaged about 6.29 per cent. A few of the mines near Cardin yielded about half as much galena as sphalerite, and in a few mines near Douthat the proportion of galena was as little as 3 per cent. On the whole the proportion of galena to sphalerite was considerably less than that recovered from the mines near Picher but more than that from the mines near Hockerville and Zincville. The proportion of galena to sphalerite recovered at all the mines in the vicinity of Douthat was about 1 ton of galena to 7.6 tons of sphalerite; in the Tar River section the mines yielded about 1 ton of galena to 4.46 tons of sphalerite.

The territory east of Picher, near the Hockerville and Zincville (St. Louis) camps, was less productive than in 1924 when the shipments from 26 mines were 31,905 tons of galena and 145,180 tons of sphalerite; in 1925 the shipments from 24 mines were 13,605 tons of galena and 103,627 tons of sphalerite, from 1,571,400 tons of ore treated. The sphalerite averaged about 58.3 per cent in zinc content, and the galena 79.1 per cent in lead content. A large part of the decrease in shipments was due to the expiration of the Beck lease of the St. Louis Smelting & Refining Co. and the closing of Nos. 1 and 2 mines.

The production of the mines near Picher decreased. In 1924 the quantity of ore milled was 3,483,000 tons, and the shipments were 40,500 tons of galena and 156,664 tons of sphalerite. In 1925 the quantity of ore milled was 3,406,400 tons, and the shipments were 32,481 tons of galena and 143,746 tons of sphalerite, with an average recovery of 5.17 per cent in concentrates. The zinc content of the sphalerite averaged about 58.4 per cent, and the lead content of the galena 78.5 per cent.

At Commerce several old mines, including the Gordon McBee worked by the Commerce Mining & Royalty Co., the Lost Trail, Turkey Fat, and Mispah, and the Emma Gordon (leased to the Incas Mining Co.), were operated in 1925. Shipments from Commerce were 664 tons of galena and 902 tons of sphalerite. The shipments of sphalerite in 1925 were only about one-third of the quantity produced by the mills as most of the output of zinc was not sold in 1925.

No shipments from Peoria, the oldest mining camp in Oklahoma, were reported in 1925. The total production of concentrates near Quapaw was comparatively small, and none of the mills near Lincolnville were in operation. The output from near Sunnyside, however, increased greatly and the area was one of the most active in the region.

The shipments from mines near Quapaw and Sunnyside were 2,594 tons of galena and 22,523 tons of sphalerite, or about four times the shipments in 1924. The zinc content of this sphalerite averaged 58.3 per cent and the lead content of the galena 76.3 per cent. About

280,000 tons of ore were milled with an average recovery of 8.99 per cent in concentrates.

New milling plants erected in 1925 and their capacity in tons per 10-hour shift are as follows: Malsbury (300), Martha B (150), Mary Jane (250), Patty C (250), Hobart (200), Donna Jane (100), Beck (300), Tri State (350), Lucky Bill tailing mill (100), American Prospecting & Mining Co. (200).

Flotation equipment is now used in virtually all the larger mills of this region. Probably 100 mills are so equipped and others will be in 1926. Some of the mills to which flotation plants were added in 1925 are as follows: Malsbury, Pioneer, Domado, Lucky Bill, Goodeagle, Dobson, Whitebird, Gordon, Chicago No. 2, Chicago No. 1, Pat, Beck, Commonwealth No. 1, Fort Worth, Tulsa, Lucky Syndicate, Tri State, Underwriters 1 and 4, Advance, Premier, Southside, Quebec, Horine Milling Co. (tailings), and American Zinc.

WISCONSIN

By J. P. Dunlop

Mine production of lead and zinc in Wisconsin in 1925, by districts

District	Lead concentrates		Zinc concentrates				Metal content [1]			
			Sphalerite		Silicate and carbonate		Lead		Zinc	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Benton-New Diggings	728	$74,526	30,171	$717,498	38	$791	523	$91,002	8,171	$1,241,992
Cuba City	68	6,229	2,472	52,713	------	------	47	8,178	705	107,160
Dodgeville	56	6,011	737	27,786	------	------	38	6,612	297	45,144
Hazel Green and Linden	171	18,061	9,164	255,398	------	------	122	21,228	2,813	427,576
Highland and Mineral Point	203	21,720	536	12,300	716	16,183	141	24,534	406	61,712
Livingston and Mifflin	144	13,738	11,081	169,685	------	------	110	19,140	2,024	307,648
Shullsburg	1,258	137,295	22,302	497,068	------	------	896	155,904	5,814	883,728
	2,628	277,580	76,463	1,732,448	754	16,974	1,877	326,598	20,230	3,074,960
Total, 1924	1,752	175,385	54,801	964,126	583	10,058	1,254	200,640	14,027	1,823,510

[1] In calculating the metal content of the ores from assays allowance has been made for roasting and smelting losses of both lead and zinc. In comparing the values of ore and metal it should be borne in mind that the value given for the ore is that actually received by the producer, whereas the value of the lead and zinc is calculated from the average price for all grades.

Tenor of lead and zinc ore and concentrates produced in Wisconsin, 1922–1925

	1922	1923	1924	1925
Total crude ore, short tons	221,000	454,000	652,000	1,003,700
Total concentrates in crude ore:				
Lead, per cent	0.43	0.22	0.27	0.26
Zinc, do	11.14	9.10	8.49	7.62
Metal content of crude ore:				
Lead, do	.32	.17	.20	.19
Zinc, do	3.58	3.17	2.77	2.53
Average lead content of galena concentrates, do	74.8	76.6	73.1	72.8
Average zinc content of sphalerite concentrates, do	33.9	35.2	32.6	32.8
Average zinc content of zinc carbonate concentrates, do	32.8	33.1	33.4	34.1
Average value per ton:				
Galena concentrates	$66.13	$82.64	$100.11	$105.62
Sphalerite concentrates	15.30	18.69	17.59	22.66
Zinc carbonate concentrates	14.09	17.56	17.25	22.51

The crude ore yields from 5 to more than 20 per cent of concentrates. The average recovery in concentrates decreased from 8.76 per cent in 1924 to 7.88 per cent in 1925. The decrease reflected the increase in the quantity of crude ore milled, and better prices for carbonates. Some tailings were treated in 1925 at New Diggings and Benton. The mining methods are determined largely by the mode of occurrence of the ores, but otherwise are similar to those in vogue in working the pockety ores at Joplin. The milling methods used in the Wisconsin field have been described by Walter Schultz [5] of the Wisconsin Zinc Co.

The zinc carbonate ore, which is mined almost entirely in the Highland and Mineral Point districts, is purchased mainly by the Mineral Point Zinc Co. and made into zinc oxide in the plant at Mineral Point, Wis. Some carbonate ores were produced, and the sales in 1925 were 754 tons, or 171 tons more than in 1924.

The metal content of the raw sphalerite concentrates shipped by the mines ranged from 23 to 55 per cent, but more than half of the concentrates sold ranged between 28 and 35 per cent. The zinc content of the roasted sphalerite concentrates shipped was 55 to 58.2 per cent.

The value of the mine output of lead and zinc in Wisconsin was $3,401,558, compared with $2,024,150 in 1924. The lead concentrates sold increased from 1,752 tons in 1924 to 2,628 tons in 1925, and the sphalerite concentrates sold increased from 54,801 tons to 76,463 tons. The metal content of the lead concentrates was 623 tons more than in 1924. The zinc content of the sphalerite and zinc-carbonate concentrates increased 6,203 tons.

Comparatively little development work was done, except by the Mineral Point Zinc Co., and few new mines were opened, although a few old properties were unwatered and operated.

About 71 per cent of the galena shipped and 86 per cent of the sphalerite shipped were the output of the Vinegar Hill Zinc Co. and the Mineral Point Zinc Co., although about 25 mills were operated. Small quantities of galena and zinc carbonate were produced by many small operators.

The lead and zinc mines of Wisconsin are in Grant, Iowa, and Lafayette Counties and contain the most valuable part of the ore deposits of the upper Mississippi Valley region, a historical review of which is given in the Illinois section of this report in Mineral Resources for 1914. A detailed description of the Wisconsin lead and zinc districts and of the mines in each district to the year 1906 is given by Bain.[6] The development of the mines subsequent to Bain's report and the output of Wisconsin mines have been set forth in Mineral Resources for 1907 to 1924.

Roasting and electromagnetic separation have been utilized in the district for many years to produce a marketable zinc product. Comparatively few of the concentrating plants are equipped with roasters, but practically all the larger mining interests own or control

[5] Schultz, Walter, "Milling Wisconsin lead-zinc ores": Eng. and Min. Jour., July 14, 1917, pp. 82–84.

[6] Bain, H. F., Zinc and Lead Deposits of the Upper Mississippi Valley: U. S. Geol. Survey Bull. 294, 1906, pp. 81–148.

separating plants.[7] The roasting and separating plants operated in Wisconsin in 1925 were those of the National Zinc Separating Co., at Cuba City; the Mineral Point Zinc Co., at Mineral Point; and the Northern Mines Co., at Shullsburg. The shipments made came from about 45 mines, many of which were small and were operated spasmodically.

Approximately 87,750 tons of sphalerite concentrates were shipped in 1925 from mines in the upper Mississippi Valley region (Illinois and Wisconsin), and all of this material except about 2,000 tons was treated at roasting and separating plants in Wisconsin. The average zinc content of the raw sphalerite concentrates from Wisconsin sold in 1925 was 32.8 per cent, and the average value per ton was $22.66; the corresponding content and value for 1917 were 32.8 per cent and $29.48; for 1918, 34.6 per cent and $25.70; for 1919, 35.3 per cent and $21.90; for 1920, 32.4 per cent and $22.64; for 1921, 25.3 per cent and $8.52; for 1922, 33.9 per cent and $15.30; for 1923, 35.2 per cent and $18.69; and for 1924, 32.6 per cent and $17.59.

The percentage of concentrates recovered from crude ore is much higher in Wisconsin than in the Joplin region, but the assay of the raw zinc concentrates shows 10 to 45 per cent less zinc content. The new concentrating plants are equipped with more tables than formerly. The concentrates from the tables have a very high iron content, but this can be remedied by roasting; in consequence, more tailings have been rerun during the last two or three years than in all years prior to 1921.

Six of the mines owned or controlled by the Mineral Point Zinc Co. (the Booty, Champion, Blackstone, Copeland, Coker, and Hoskins) were worked in 1925. The Vinegar Hill Zinc Co. worked the Bull Moose mine at New Diggings, Monmouth at Hazel Green, where the mill was burned in December, 1925, and the Rodham-McQuitty and the James mines near Shullsburg. The larger mines and mills busy in 1925 were the Booty, Bull Moose, Blackstone, Fields Meloy, Champion, Nightingale, and Hoskins at New Diggings; the Connecting Link at Cuba City; the Ellis and Lucky Five at Dodgeville; the Coker (No. 2) at Livingston; the Monmouth, at Hazel Green; the Rule and South Rule at Linden; and the Northern Mines Co., Rodham-McQuitty, James, and Copeland at Shullsburg.

During 1925 the Vinegar Hill Zinc Co. abandoned several mines, including the Nightingale, Yewdall, Rundell, and Jefferson. The tailings mills active in 1925 were those of the Burr Milling Co., at the Burr mine; Hillary & Lawyer at the Champion mine; Cherry and Poppa on the Winskill; and the Martin Tailing Co., at New Diggings.

The owners of the Connecting Link mine, near Cuba City, operated only one of their two mills in 1925.

The largest producers of zinc carbonate ore were Flynn & Co., Delaney & Co., Williams & Co., Frank Fecht, Minter Mining Co., and Salzman & Co. at Highland. In addition to the zinc carbonate ore shipped, about 1,900 tons of mixed sphalerite and zinc carbonate and silicate ores which were included with the sphalerite were sold

[7] Deutman, E. G., "The roasting and magnetic separation of Wisconsin zinc ores"; Eng. and Min. Jour., June 28, 1919, pp. 1107–1111.

in 1925. Most of the mixed ore had a zinc content of 45 to 48 per cent. Mines in the Shullsburg district produced nearly one-half of the galena shipped in 1925, and most of the remainder came from mines at New Diggings.

The largest producer of lead and zinc concentrates from a small plant in 1925 was the Rule Mining Co. at Linden. Another small plant was reconstructed in 1925 at the South Rule mine at Linden. The raw sphalerite sold by the company averaged 53.2 per cent, which is much higher than usual in Wisconsin. The 125-ton Rule mill is equipped with Butchart tables.

For descriptions of old mines, concentrating plants, and roasting plants in which no essential changes were made during 1925 the reader is referred to Mineral Resources for recent years.

85931°—28——19

GOLD, SILVER, COPPER, LEAD, AND ZINC IN CALIFORNIA

(MINE REPORT)

By James M. Hill[a]

PRODUCTION

The total value of the gold, silver, copper, lead, and zinc produced in California in 1925 increased 1.5 per cent as compared with 1924. Production of gold from the lode mines decreased 7 per cent, but the yield of placer gold increased 11 per cent. The total production of gold decreased 0.65 per cent. The output of silver was 14 per cent less in quantity than in 1924 but only 11 per cent less

Mine production of gold, silver, copper, lead, and zinc in California, 1916–1925

Year	Number of producing mines	Ore and tailings	Gold[1]	Silver[1]	Copper	Lead	Zinc	Total value
		Short tons		*Fine ounces*	*Pounds*	*Pounds*	*Pounds*	
1916	589	3,187,642	$21,410,741	2,564,354	55,897,118	12,407,493	15,256,485	$89,749,263
1917	490	3,003,250	20,087,504	1,775,431	48,153,139	21,868,628	10,872,716	37,685,985
1918	703	2,503,411	16,528,953	1,427,711	47,674,660	13,372,049	5,561,393	31,187,807
1919	650	1,714,911	16,695,955	1,107,189	21,732,507	3,568,267	472,990	22,201,898
1920	500	1,165,022	14,311,043	1,705,327	12,626,272	4,813,510	1,165,509	18,973,660
1921	573	1,215,600	15,704,822	3,629,223	11,743,404	1,124,276	846,184	20,941,845
1922	565	1,539,933	14,670,346	3,100,065	22,539,485	6,312,536	3,012,950	21,332,168
1923	621	1,535,691	13,379,013	3,559,443	28,317,759	9,549,680	----------	21,128,945
1924	533	2,019,200	13,150,175	3,555,133	52,107,171	4,763,806	3,060,000	22,938,157
1925	691	1,938,679	13,065,330	3,054,416	46,864,913	6,566,200	11,489,237	23,284,354

[1] Includes placer production.

Gold and silver produced at placer mines in California, 1916–1925

Year	Dredge		Drift		Hydraulic		Surface		Total value
	Gold	Silver	Gold	Silver	Gold	Silver	Gold	Silver	
		Fine ounces		*Fine ounces*		*Fine ounces*		*Fine ounces*	
1916	$7,769,227	25,155	$251,297	1,360	$390,015	2,055	$165,118	1,041	$8,595,141
1917	8,313,527	24,747	366,759	1,091	267,103	1,000	126,641	419	9,096,490
1918	7,431,927	[1] 27,840	108,420	575	213,229	[1] 903	85,203	591	7,868,688
1919	7,716,919	[1] 25,740	85,341	[1] 554	184,832	[1] 1,249	45,984	[1] 381	8,064,351
1920	6,900,366	28,918	62,925	374	66,233	413	31,089	195	7,093,204
1921	7,756,787	36,322	127,411	615	162,808	864	107,818	829	8,193,454
1922	4,999,215	16,608	252,626	1,391	158,275	906	89,739	708	5,519,468
1923	6,065,735	17,569	184,771	955	111,828	626	160,249	1,155	6,539,233
1924	4,305,521	14,793	98,568	560	60,195	409	124,088	928	4,599,554
1925	4,750,842	16,478	66,523	358	175,345	958	103,434	785	5,109,038

[1] Revised figures.

[a] Helen M. Gaylord, of the Bureau of Mines, assisted in the preparation of this report.

in value. Production of copper decreased 10 per cent in quantity but only 3 per cent in value. The output of lead increased 38 per cent in quantity and 50 per cent in value. There was an increase of 275 per cent in the quantity of zinc produced in 1925 and of 339 per cent in its value.

ORE

The quantity of ore and tailings treated in California in 1925 was 1,938,679 short tons, a decrease of 4 per cent as compared with 1924. Gold ore and tailings decreased 18 per cent and yielded 6 per cent less gold and 33 per cent less silver than in 1924. Silver ore and tailings decreased 8 per cent in quantity and yielded 14 per cent less gold and 13 per cent less silver than in the preceding year. Copper ore and tailings treated in 1925 increased 9 per cent, but yielded 22 per cent less gold, 20 per cent less silver, and 11 per cent less copper than in 1924. Lead ore treated increased 10 per cent and yielded 186 per cent more gold, 34 per cent more lead, 7 per cent less silver, and 26 per cent less copper than the lead ore treated in 1924. Zinc ore increased 271 per cent and yielded 49 per cent more silver, 78 per cent more copper, and 264 per cent more zinc, but 10 per cent less gold than the zinc ore treated in 1924. No lead-zinc ore was reported treated in 1924, but in 1925 mines in the southern part of the State shipped 1,456 tons. The average value in metals of the ore and tailings treated in 1925 increased 30 cents a ton; gold ore and tailings increased $1.18 a ton; silver ore and tailings decreased 60 cents a ton; copper ore and tailings decreased $1.10 a ton; lead ore increased $7.96 a ton; and zinc ore decreased 60 cents a ton.

Ore and metals produced in California in 1925

Source	Ore and tailings		Gold		Silver	
	Short tons	Per cent	Fine ounces	Per cent	Fine ounces	Per cent
Dry gold ore and tailings	803,712	41.46	359,390.88	56.86	104,560	3.42
Dry silver ore and tailings	82,913	4.28	7,073.75	1.12	1,992,859	65.25
Copper ore and tailings	999,006	51.53	16,584.58	2.62	704,506	23.06
Lead ore	18,208	.94	2,277.62	.36	174,494	5.71
Zinc ore	33,384	1.72	180.02	.03	33,492	1.10
Lead-zinc ore	1,456	.07	2.50		25,926	.85
Total, lode mines	1,938,679	100.00	385,509.35	60.99	3,035,837	99.39
Total, placers			246,525.96	39.01	18,579	.61
	1,938,679	100.00	632,035.31	100.00	3,054,416	100.00
Decrease from 1924	80,521		4,104.41		500,717	

Source	Copper		Lead		Zinc	
	Pounds	Per cent	Pounds	Per cent	Pounds	Per cent
Dry gold ore and tailings	122					
Dry silver ore and tailings						
Copper ore and tailings	[1]46,106,627	98.51				
Lead ore	58,342	.12	6,364,985	96.94	27,238	0.24
Zinc ore	639,822	1.37	4,072	.06	11,125,523	96.83
Lead-zinc ore			197,143	3.00	336,476	2.93
	46,864,913	100.00	6,566,200	100.00	11,489,237	100.00
Increase or decrease from 1924	−5,242,258		+1,802,394		+8,429,237	

[1]Includes copper from mine water.

Value of metals from ore and tailings treated in California in 1925

Kind of ore	Ore and tailings (short tons)	Total value		Average value per ton	
		In gold and silver	In all metals	In gold and silver	In all metals
Dry gold ore and tailings	803,712	$7,501,834	$7,501,851	$9.33	$9.33
Dry silver ore and tailings	82,913	1,529,272	1,529,272	18.44	18.44
Copper ore and tailings	999,006	831,761	[1]7,387,422	.83	7.39
Lead ore	18,208	168,181	732,290	9.24	40.22
Zinc ore	33,384	26,965	963,713	.81	28.87
Lead-zinc ore	1,456	18,044	60,768	12.39	41.74
	1,938,679	10,076,057	18,175,316	5.20	9.38

[1] Includes value of copper from mine water.

Ore and tailings sold or treated in California in 1925, with content in terms of recovered metals

DRY GOLD ORE AND TAILINGS

County	Ore and tailings	Gold	Silver	Copper	Lead
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*
Alpine	5	10.60	2		
Amador	366,605	112,544.57	23,162		
Butte	14,551	5,193.18	4,803		
Calaveras	109,273	28,684.93	4,765		
Eldorado	1,921	1,304.25	251		
Fresno	33	22.20	4		
Inyo	195	70.90	73	122	
Kern	6,537	6,430.61	3,331		
Lassen	75	54.64	34		
Madera	104	110.15	117		
Mariposa	12,593	9,025.47	2,483		
Mono	65	263.81	238		
Monterey	125	48.28	4		
Nevada	195,961	109,964.57	46,230		
Placer	6,591	3,589.38	606		
Plumas	1,318	682.92	137		
San Bernardino	744	542.05	170		
San Diego	230	195.16	80		
Shasta	13,188	2,326.20	3,749		
Sierra	37,738	64,928.76	12,695		
Siskiyou	1,204	5,747.01	711		
Trinity	1,937	273.62	65		
Tuolumne	32,569	7,244.25	845		
Yuba	150	133.37	5		
	803,712	359,390.88	104,560	122	
Decrease from 1924	182,386	24,405.72	51,309	578	5,613

DRY SILVER ORE AND TAILINGS

Kern	1,074	67.30	7,382		
Napa	275	9.44	2,046		
San Bernardino	81,564	6,997.01	1,983,431		
	82,913	7,073.75	1,992,859		
Decrease from 1924	6,847	1,181.99	302,824		

COPPER ORE AND TAILINGS

Calaveras	113,165	135.30	7,032	4,893,414	
Mono	20	2.00	1,542	893	
Plumas	675,314	10,217.37	423,733	26,917,873	
Riverside	1		32	392	
San Bernardino	22	.81	125	2,854	
Shasta	201,686	5,610.58	263,257	13,911,435	
Trinity	8,798	618.52	8,785	439,766	
	999,006	16,584.58	704,506	[1]46,166,627	
Increase or decrease from 1924	+81,200	−4,544.92	−171,787	−5,501,490	

[1] Includes copper from mine water.

Ore and tailings sold or treated in California in 1925, with content in terms of recovered metals—Continued

LEAD ORE

County	Ore	Gold	Silver	Copper	Lead	Zinc
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*
Butte	5	3.77	510	307	725	
Inyo	17,492	2,022.03	167,358	45,976	6,148,652	27,238
Kern	20		15		442	
Mono	25	.38	511		14,044	
Riverside	319	178.34	3,671	10,644	115,491	
San Bernardino	347	73.10	2,429	1,415	85,631	
	18,208	2,277.62	174,494	58,342	6,364,985	27,238
Increase or decrease from 1924	+1,672	+1,482.25	−13,604	−20,012	+1,606,792	+27,238

ZINC ORE

Inyo	93				4,072	56,448
Shasta	33,291	180.02	33,492	639,822		11,069,075
	33,384	180.02	33,492	639,822	4,072	11,125,523
Increase or decrease from 1924	+24,384	−19.98	+10,992	+279,822	+4,072	+8,065,523

LEAD-ZINC ORE[1]

Inyo	346		2,242		43,296	66,136
Los Angeles	716		22,251		150,820	199,420
Orange	394	2.50	1,433		3,027	70,920
	1,456	2.50	25,926		197,143	336,476

[1] No lead-zinc ore produced in 1924.

GOLD

The value of the gold produced in California in 1925 was $13,065,330, a decrease of less than 1 per cent as compared with 1924. Lode mines yielded 61 per cent and placer mines 39 per cent of the total gold in 1925, as compared with 65 per cent and 35 per cent, respectively, in 1924.

Five counties produced more than $1,000,000 in gold in 1925. Yuba, with $2,570,630 produced largely by dredges, was first in rank; Amador, with $2,338,101 almost entirely from gold quartz mines, was second; Nevada, with $2,305,607 from gold quartz and a few placer mines, was third; Sierra, with $1,373,705 from gold quartz and placer (chiefly hydraulic) mines, was fourth; and Sacramento, with $1,302,320 entirely from placer mines, was fifth. The next largest output of gold, $652,433, came from Calaveras County, largely from gold quartz mines and one dredge operation, followed by Trinity County, with $424,037 largely from dredge and hydraulic placer mines.

In 1925 there were 41 companies in the State that produced more than 1,000 ounces of gold each and contributed 90 per cent of the total gold output of the State. Of these 8 produced more than 20,000 ounces and 4 more than 50,000 ounces. Of these 41 companies 12 operated gold dredges, 1 operated a lead and 1 a silver mine, 3 operated copper mines, and 24 operated gold quartz mines. The 10 largest gold-producing companies in California in 1925, in order of output, were the Yuba Consolidated Gold Fields (6 dredges), Natomas Co. of California (8 dredges), Empire Mines Co. (gold quartz), Sixteen to One Mine Co. (gold quartz), Kennedy Mining & Milling Co. (gold quartz), North Star Mines Co. (gold quartz), Argonaut Mining Co. (gold quartz), Carson Hill Gold Mines (Inc.) (gold quartz), Central Eureka Mining Co. (gold quartz), and the Walker Mining Co. (copper ore).

The yield of gold from placer mines in 1925 was valued at $5,096,144, an increase of 11 per cent as compared with 1924. There was an increased gold yield of 10 per cent by dredges and 191 per cent by hydraulic mines, but decreases of 33 per cent and 17 per cent by drift and surface mines, respectively, as compared with 1924. In 1925 dredges yielded 93 per cent, drift mines slightly over 1 per cent, hydraulic mines nearly 4 per cent, and surface workings 2 per cent of the gold from placer deposits.

Placer mines of Yuba County increased their gold production by $575,138, Sacramento County by $151,633, Siskiyou County by $33,229, Humboldt County by $11,873, and Nevada County by $10,415, as compared with 1924, and the placer mines of Amador, Mariposa, Placer, and Sierra Counties increased their output by more than $3,000 each. There were slight increases in placer yield from Del Norte, Eldorado, Inyo, Los Angeles, Plumas, San Diego, San Luis Obispo, and Trinity Counties. The gold produced at placer mines declined in Butte County by $193,015, Calaveras County by $40,874, Shasta County by $31,572, and Stanislaus County by $24,277, as compared with 1924. In Fresno, Kern, Madera, Merced, and Tuolumne Counties less placer gold was produced than in the previous year. Production of gold by 24 dredges in 1925 was $4,750,842, an increase of $445,321 as compared with 1924. There was an increased output by dredges in Sacramento and Yuba Counties, but declines in the gold yield from dredges in Butte, Calaveras, Placer, Shasta, Stanislaus, and Trinity Counties. Gold produced at 71 drift mines in 1925 was valued at $66,523, a decrease of $32,045 as compared with 1924. Increases in gold from drift mines were recorded from Eldorado, Placer, Shasta, Trinity, and Yuba Counties, but decreases from drift mines in Butte, Calaveras, Mariposa, Nevada, Plumas, Sierra, and Tuolumne Counties. Drift mines in Sacramento County were productive in 1925 but not in 1924. Gold produced at 98 hydraulic mines in 1925 was valued at $175,345, an increase of $115,150 as compared with 1924. The gold output of hydraulic mines increased in Siskiyou County by $31,644, in Trinity County by $25,196, in Sierra County by $18,343, in Nevada County by $15,321, in Humboldt County by $12,569, and by less than $10,000 in Amador, Plumas, Shasta, and Yuba Counties. Gold produced by 166 surface or sluice operations in 1925 was valued at $103,434, a decrease of $20,654 as compared with 1924. In virtually all the mining counties of the State gold is recovered by itinerant placer prospectors, and it is very difficult to apportion properly the gold produced by them.

The output of gold from 332 lode mines in California in 1925 was valued at $7,969,186, a decrease of 7 per cent as compared with 1924. The output of gold from the lode mines of both Amador and Nevada Counties was more than $2,000,000, of Sierra County more than $1,000,000, of Calaveras County more than $500,000, and of Plumas County more than $200,000. Over $100,000 in gold was produced by lode mines in Mariposa, Shasta, San Bernardino, Tuolumne, Kern, Siskiyou, and Butte Counties. Lode mines of Nevada County yielded $524,840 less gold, of Amador County $375,401 less gold, and of Calaveras County $160,654 less gold than in 1924. There was a decreased yield of more than $25,000 from the lode mines in Mono, Plumas, San Bernardino, Shasta, and Tuolumne

Counties. Large increases of value in gold were recorded from lode mines in Sierra County ($569,262), Siskiyou County ($83,321), and Butte County ($63,774). Gold ore and tailings yielded 93 per cent, copper ore and tailings 4 per cent, silver ore and tailings 2 per cent, and lead and zinc ores 1 per cent of the total gold from lode mines. Of the gold recovered from ore and tailings in 1925, 72 per cent was recovered by amalgamation, 16 per cent by cyanidation, and 12 per cent by smelting.

It is estimated that approximately 6 per cent of the gold output from lode mines was stolen and sold by "high graders" in 1925. It is further estimated that two-thirds of the "high grade" sold during 1925 was sold prior to July 24, when the California high grade law went into effect.

SILVER

The output of silver in 1925 was 3,054,416 ounces, valued at $2,119,765, a decrease of 14 per cent in quantity and 11 per cent in value as compared with 1924. Four counties yielded more than 100,000 ounces of silver each in 1925, namely, San Bernardino, with 1,986,155 ounces largely from silver ore produced by the California Rand Silver (Inc.); Plumas County, with 423,997 ounces largely from copper ores of the Engels and Walker mines; Shasta County, with 300,890 ounces largely from copper and zinc ores; and Inyo County, with 169,688 ounces, most of which was from lead ore. The next largest silver production was 46,333 ounces from Nevada County, nearly all from gold ores, followed by 23,232 ounces from Amador County, virtually all from gold ores.

The yield of silver from placer mines in 1925 was 18,579 ounces, an increase of 11 per cent as compared with 1924, and 0.61 per cent of the total silver output of the State. Of the 3,035,837 ounces of silver produced at lode mines in 1925 silver ore and tailings yielded 66 per cent, copper ore and tailings 23 per cent, lead ore 6 per cent, gold ore and tailings 3 per cent, and zinc ore and lead-zinc ore each 1 per cent. The output of silver decreased in all the more important silver-producing counties except Plumas, which increased its yield of silver by 54,491 ounces. San Bernardino County produced 299,812 ounces less, Shasta County 211,651 ounces less, and Inyo County 3,146 ounces less silver than in 1924.

Silver production at each of 45 properties was in excess of 1,000 ounces in 1925, and these mines yielded 98 per cent of the total silver produced in the State. At 30 properties the yield was between 1,000 and 10,000 ounces, at 11 between 10,000 and 60,000, at 3 between 100,000 and 300,000, and at 1 mine in excess of 1,000,000 ounces in 1925. The 10 largest silver producers in California in 1925, in order of output, were the California Rand Silver (Inc.), U. S. Smelting, Refining & Mining Co. (Mammoth mines), Walker Mining Co., Engels Copper Mining Co., Tecopa Consolidated Mining Co., Shorey's tailings plant, Mulcahy Bros., Cerro Gordo Mines Co., California Zinc Co., and the Empire Mines Co.

COPPER

The copper production of California in 1925 was 46,864,913 pounds, valued at $6,654,818, a decrease of 10 per cent in quantity and 3 per

cent in value as compared with the output in 1924. Plumas County led in copper output, producing 26,917,873 pounds, an increase of 1,360,197 pounds as compared with 1924. Shasta County was second in rank with a yield of 14,551,257 pounds, a decrease of 6,504,770 pounds as compared with 1924. The output of 4,893,414 pounds of copper in Calaveras County in 1925 was slightly more than in 1924. Trinity County yielded 439,766 pounds, which was 109,832 pounds less than in 1924.

Copper ore was the source of 95 per cent, zinc ore 1 per cent, and mine water and tailings nearly 4 per cent of the copper recovered in 1925. A minor quantity of copper was recovered from lead ore.

LEAD

Many properties in Inyo County shipped lead ore in 1925, and the county produced 94 per cent of the lead yield of the State. The next largest output of lead came from lead concentrates milled from ore mined at the Black Jack mine on Catalina Island, Los Angeles County. Riverside County ranked third in lead output in 1925 and San Bernardino County was fourth, the output coming from mines in the Clark and Shadow Mountains. The total production of lead from the State in 1925 was 6,566,200 pounds, valued at $571,259, an increase of 38 per cent in quantity and 50 per cent in value as compared with 1924. Lead ore supplied nearly 97 per cent and lead-zinc ore 3 per cent of the lead produced in the State.

ZINC

The production of zinc in California in 1925 was 11,489,237 pounds, valued at $873,182, an increase of 275 per cent in quantity and 339 per cent in value as compared with 1924. Shasta County produced 96 per cent of the total, but mines in Los Angeles, Inyo, and Orange Counties added to the supply. During the first few months of the year zinc oxide was made by the California Zinc Co. in Shasta County. In the summer, however, the demand for zinc for export was so insistent that all ore was concentrated and the concentrate was exported.

METALLURGIC INDUSTRY

The quantity of ore treated at gold and silver mills in 1925 was 704,662 tons, a decrease of 14 per cent as compared with the ore treated by mills in 1924. Bullion recovered by "high graders" from ore in 1925 amounted to 23,451.64 ounces of gold and 5,389 ounces of silver. Bullion saved by amalgamation in 1925 carried 278,117.93 ounces of gold and 61,652 ounces of silver. Cyanide precipitates carried 61,404.90 ounces of gold and 129,904 ounces of silver.

Concentrating mills in 1925 treated 887,622 tons of ore, an increase of 14 per cent as compared with 1924. Concentrates produced in 1925, including those made at gold and silver mills, amounted to 96,832 tons, an increase of 13 per cent as compared with 1924. The quantity of copper concentrates increased 5,760 tons and lead concentrates decreased 690 tons, as compared with 1924. Gold and silver concentrates decreased 4,137 and 638 tons, respectively, in 1925.

The quantity of crude ore shipped to smelters in 1925 was 29 per cent less than in 1924, the decreases being in copper ore, 82,935 tons,

and silver ore, 1,421 tons. All other classes of ore to smelters increased—gold ore by 4,026 tons, lead ore by 7,917 tons, and zinc ore by 3,912 tons. The ore sent to smelters yielded 14 per cent less gold, 42 per cent less silver, and 32 per cent less copper, but 59 per cent more lead and 77 per cent more zinc than the ore smelted in 1924.

Miscellaneous materials classed as tailings, which were treated by cyanidation, amalgamation, leaching, and smelting in 1925, amounted to 178,532 tons and yielded 8,328.47 ounces of gold, 58,725 ounces of silver, and 1,666,274 pounds of copper.

Metallurgic recovery of metals in California in 1925

Method of recovery	Material treated	Gold	Silver	Copper	Lead	Zinc
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*
Ore amalgamated [1]	690,443	277,918.37	61,568			
Ore cyanided	14,219	35,783.18	71,768			
Concentrates cyanided	6,032	17,616.54	4,696			
Tailings amalgamated	100	199.56	84			
Tailings cyanided	86,070	8,005.18	53,440			
Ore smelted	167,863	12,395.03	465,040	13,899,970	6,400,643	5,415,555
Concentrates smelted	90,800	33,467.76	2,374,040	31,298,669	165,557	6,073,682
Tailings smelted	92,362	123.73	5,201	[2] 1,666,274		
		385,509.35	3,035,837	46,864,913	6,566,200	11,489,237

[1] Includes 23,451.64 ounces of gold and 5,389 ounces of silver from "high grade."
[2] Includes copper from mine water.

Gold and silver produced at mills in California in 1925

County	Ore to gold and silver mills [1]	Gold in bullion	Silver in bullion
	Short tons	*Fine ounces*	*Fine ounces*
Alpine	5	10.60	2
Amador	281,060	89,093.36	17,758
Butte	14,551	5,114.18	4,790
Calaveras	109,269	17,081.46	1,626
Eldorado	1,919	1,299.26	249
Fresno	33	22.20	4
Inyo	190	54.13	63
Kern	5,569	5,944.49	2,754
Lassen	75	54.64	34
Madera	104	92.68	77
Mariposa	12,592	8,634.75	2,112
Mono	60	3.98	4
Monterey	125	17.22	1
Nevada	195,960	109,067.67	45,088
Placer	6,591	3,555.40	599
Plumas	1,318	682.92	137
San Bernardino	954	515.10	44,131
San Diego	230	173.83	56
Shasta	601	412.20	83
Sierra	37,696	63,612.91	12,504
Siskiyou	1,204	5,734.00	615
Trinity	1,937	273.62	65
Tuolumne	32,569	2,180.53	581
Yuba	50	70.42	3
	704,662	[2] 313,701.55	[2] 132,336
Increase or decrease from 1924	−117,837	+20,610.47	+11,111
Average content per ton		0.4452	0.1892

[1] Tailings excluded.
[2] Includes 23,451.64 ounces of gold and 5,389 ounces of silver from "high grade."

Metals produced from California concentrates in 1925

BY COUNTIES

	Ore to concentrating mills	Concentrates	Gold	Silver	Copper	Lead	Zinc
	Short tons	*Short tons*	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*
Amador		3,914	15,446.03	4,042			
Calaveras	110,003	19,428	11,642.64	7,856	3,750,063		
Inyo	61	33	2.31	463	154	11,710	4,267
Los Angeles	716	307		22,251		150,820	199,420
Madera		5	17.47	40			
Mariposa		28	369.28	365			
Monterey		2	31.06	3			
Nevada		405	870.76	1,122			
Orange	394	23	2.50	1,433		3,027	70,920
Placer		17	33.98	7			
Plumas	675,277	52,435	10,216.07	423,504	26,908,630		
San Bernardino	80,699	7,312	6,971.00	1,883,759			
Shasta	20,472	11,069	180.02	33,492	639,822		5,799,075
Sierra		10	224.45	39			
Siskiyou		2	13.01	96			
Tuolumne		1,842	5,063.72	264			
	887,622	96,832	51,084.30	2,378,736	31,298,669	165,557	6,073,682
Increase or decrease from 1924	+109,806	+11,249	−20,716.02	−217,081	+1,106,032	−569,943	+6,073,682

BY KINDS OF CONCENTRATES

Dry gold	9,906	33,649.75	9,103			
Dry silver	7,312	6,971.00	1,883,759			
Copper	68,501	10,291.73	431,105	31,298,515		
Lead	159	2.31	19,207	154	138,080	4,267
Zinc	10,954	169.51	35,562		27,477	6,069,415
	96,832	51,084.30	2,378,736	31,298,669	165,557	6,073,682

AVERAGE RECOVERABLE CONTENT

	Fine ounces per ton	*Fine ounces per ton*	*Per cent*	*Per cent*	*Per cent*
Dry gold	3.40	0.92			
Dry silver	.95	257.63			
Copper	.15	6.29	22.85		
Lead	.01	120.80	.05	43.42	1.34
Zinc	.02	3.25		.13	27.70
Average	.53	24.57	16.16	.09	3.14

Metals produced from California crude ore shipped to smelters in 1925[1]

BY COUNTIES

	Crude ore	Gold	Silver	Copper	Lead	Zinc
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*
Butte	5	3.77	510	307	725	
Calaveras	3,166	23.48	14	937,544		
Eldorado	2	4.99	2			
Inyo	17,875	2,036.49	169,147	45,944	6,184,310	145,555
Kern	2,062	553.42	7,974		442	
Mariposa	1	8.26	3			
Mono	50	254.88	2,262	893	14,044	
Napa	275	9.44	2,046			
Nevada	1	10.37	3			
Plumas	37	1.30	229	9,243		
Riverside	320	178.34	3,703	11,036	115,491	
San Bernardino	499	126.87	6,187	4,269	85,631	
Shasta	134,730	7,473.50	264,023	12,450,968		5,270,000
Sierra	42	1,091.40	152			
Trinity	8,798	618.52	8,785	439,766		
	167,863	12,395.03	465,040	13,899,970	6,400,643	5,415,555
Increase or decrease from 1924	−68,155	−2,059.98	−340,743	−6,521,695	+2,372,337	+2,355,555

[1] Tailings excluded.

Metals produced from California crude ore shipped to smelters in 1925—Continued

BY KINDS OF ORE

	Crude ore	Gold	Silver	Copper	Lead	Zinc
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*
Dry gold	13,618	3,838.85	4,641	122		
Dry silver	1,476	68.74	13,056			
Copper	121,364	6,182.13	271,070	13,841,660		
Lead	18,147	2,275.31	174,031	58,188	6,353,275	22,971
Zinc	12,912				4,072	5,326,448
Lead-zinc	346		2,242		43,296	66,136
	167,863	12,395.03	465,040	13,899,970	6,400,643	5,415,555

AVERAGE RECOVERABLE CONTENT

	Fine ounces per ton	*Fine ounces per ton*	*Per cent*	*Per cent*	*Per cent*
Dry gold	0.28	0.34			
Dry silver	.07	8.85			
Copper	.05	2.23	5.70		
Lead	.13	9.59	.16	17.51	0.06
Zinc				.02	20.63
Lead-zinc		6.48		6.26	9.56
Average	.07	2.77	4.14	1.91	1.61

MINING INDUSTRY

The gold, silver, copper, lead, and zinc produced in the State came from 34 counties in 1925, as compared with 31 counties in 1924. Production in 1925 came from 691 properties, of which 359 were placers and 332 lode mines. No output was recorded from mines in Imperial County, but for the first time in many years mines in Alpine, Monterey, Napa, and San Luis Obispo Counties were productive. Named in order of output the 10 counties with the largest production of metals were Plumas, $4,366,132; Shasta, $3,351,359; Yuba, $2,577,030; Amador, $2,354,224; Nevada, $2,337,762; San Bernardino, $1,543,822; Sierra, $1,382,624; Calaveras, $1,355,622; Sacramento, $1,304,240; and Inyo, $718,523. The yield of Amador, Nevada, and Sierra Counties was largely from gold quartz mines, that of Calaveras largely from a copper mine and gold quartz mines, that of Plumas and Shasta from copper mines, augmented in Shasta County by production from zinc mines, that of Inyo largely from lead mines, that of San Bernardino largely from a silver mine, and that of Yuba and Sacramento Counties largely from gold dredges.

The lode mines yielding gold were less productive than in 1924, but development was going on at various camps and was expected to give results. However, the Alleghany district of Sierra County was the only gold quartz district in California which produced much more gold than in 1924. In the northern part of the State the happenings of chief interest were the closing down of all operations by the U. S. Smelting, Refining & Mining Co. at the copper mines and smelter near Kennett, the enlarged operations of the California Zinc Co. at Bully Hill, where smelting was abandoned in favor of flotation-concentration, and the beginning of production at the Afterthought mine at Ingot after a number of months spent in development. Hydraulic mines on the Klamath, Salmon, and Trinity Rivers were more active than in 1924. Quartz mines in the region between Forks of Salmon and Etna Mills, Siskiyou County, were under development, and a rich pocket was found at the Independence mine near Happy Camp. In Trinity County lessees worked properties in East-

man Gulch, and the United Trinity Mines Co. began producing at the Bonanza King mine, near Carrville. In Butte County the Surcease quartz mine near Yankee Hill made a good output. Dredging near Chico and Oroville ceased, except for the work on Feather River by the Thurman Gold Dredging Co. In Plumas County the Engels and Walker copper mines continued large-scale operations. The Jamison mine at Johnsville and several gold mines near Spring Garden changed ownership. The Alleghany district in Sierra County was particularly active, a number of mines being under development. The Sixteen to One was the largest producer in the district. The North Star Mines Co. gave up its option on the Rainbow mine. Early in the year a trial run at the Scales Syndicate hydraulic mine was disappointing, and that company withdrew from the field. In Nevada County the Golden Center and Brunswick mines were again productive after several months of idleness. Extensive development at the North Star mine, to open up the X vein below the 6,000-foot level, somewhat retarded production. The Empire was active throughout the year. A new company, headed by Errol MacBoyle, took over the operation of the Idaho-Maryland and adjoining ground. The Washington district was the most active outside of Grass Valley in Nevada County.

Gold and silver recovered at gold mills in Mother Lode counties in California in 1925 [1]

County	Ore treated	Gold and silver recovered in bullion			Concentrates produced [2]	Gold and silver recovered from concentrates			Value of total recovery	
		Gold	Silver	Average value per ton of ore		Gold	Silver	Average value per ton of concentrates	Total	Average value per ton of ore
	Short tons	*Fine ounces*	*Fine ounces*		*Short tons*	*Fine ounces*	*Fine ounces*			
Amador	281,060	89,093.36	17,758	$6.60	3,914	15,446.03	4,042	$82.30	$2,176,150	$7.74
Calaveras	109,269	17,081.46	1,626	3.24	3,681	11,579.99	3,125	65.62	595,782	5.45
Eldorado	1,919	1,299.26	249	14.09					27,031	14.09
Mariposa	12,592	8,634.75	2,112	14.29	28	369.28	365	281.68	187,849	14.92
Tuolumne	32,569	2,180.53	581	1.40	1,842	5,063.72	264	56.93	150,338	4.62
	437,409	118,289.36	22,326	5.63	9,465	32,459.02	7,796	71.46	3,137,150	7.17

[1] Tailings excluded. [2] Includes only concentrates made from gold ore.

On the Mother Lode the production of mines in Amador, Calaveras, and Tuolumne Counties was less, but mines in Eldorado and Mariposa Counties increased their yield. In Eldorado County the chief producers were the Martinez and Red Wing near El Dorado, the Hines Gilbert at Greenwood, and the Guildford at Poverty Point, near Placerville. In Amador County the Fremont-Gover was worked for six months and was then closed down; the Plymouth was idle until taken over by the Argonaut interests in midsummer. The Central Eureka, Kennedy, and Argonaut were the largest producers on the lode. Control of the Moore mine passed to F. H. Rindge. Few of the mines near San Andreas or Angels Camp, Calaveras County, were active. The Carson Hill and Finnegan, at Carson Hill, were worked as usual. In Tuolumne County along the Mother Lode the Eagle Shawmut was the chief producer, and production continued at the Clio, Golden Gate, Ham & Birney, Heslop, and Silken properties. Some work was also under way at various properties near Sonora and Tuttletown.

In Mariposa County the Original mine was as usual the largest producer. Lessees at several places on the Mariposa Grant were working, and the Princeton mill ran intermittently on ore from that mine.

In Fresno and Madera Counties and in central Kern County mining was quiet. In the Randsburg district the Yellow Aster, King Solomon, Butte Lode, and several smaller mines produced gold ores, and the California Rand Silver (Inc.), in San Bernardino County, had a good year. The increased price of lead and zinc and the insistent demand for both classes of ore caused much activity in Inyo County and various mines in the White Mountain, Slate, and Panamint Ranges and the Coso and Argus Mountains made shipments. The Cerro Gordo, Ophir, Santa Rosa, and Tecopa were the largest shippers of lead ore, and the Collins, Colorado, Montezuma, and Morning Star shipped ore carrying zinc. Aside from the Randsburg district, on the line between Kern and San Bernardino Counties, the mines of San Bernardino County were not particularly active, though north of Daggett and Barstow the Paradise and Silver King mines were productive. On Gold Mountain, southeast of Victorville, the Arlington Mining Corporation was reopening a group of claims, and the Gold Mountain mine near Pine Knot was productive. The Julian district was the most active camp in San Diego County, with work going on at the Oriflamme, Eagle, and Golden Chariot properties. On Santa Catalina Island a 100-ton flotation plant was erected to handle lead-zinc ore from the Black Jack mine.

The dredging industry of California was 10 per cent more productive than in 1924, the yield in 1925 being valued at $4,762,278, of which $4,750,842 was in gold. There were 24 boats in operation, as compared with 27 in 1924. Three dredges in Butte County finished their ground during 1925, but one was moved to a new location on Feather River. One new dredge started digging on Willow Creek in Yuba County. The Camanche dredge near Jenny Lind, Calaveras County, was being repaired. The total quantity of gravel dug by dredges in 1925 was 49,552,000 cubic yards, indicating an average recovery of 9.61 cents a yard as compared with 9.32 cents in 1924 and 10.25 cents in 1923. The total production of gold by dredges since the beginning of the industry has been $145,121,297, of which the Feather River field has yielded $32,873,908, the Yuba River field $54,399,182, and the American River field $33,619,338.

The State legislature passed the so-called "high grade law," which was signed by the governor on April 15, 1925, and became effective July 24, 1925. The act provides for the licensing of ore and bullion buyers and its purpose is to stop the stealing of gold, which was prevalent in the mines along the Mother Lode and in Nevada and Sierra Counties. The adminstration of the law was placed in the hands of the State mineralogist and has been effective in curbing the sale of stolen gold. It has been shown that in 1924 approximately $500,000 worth of "high grade" was sold. In 1925 the quantity sold was valued at $488,500, but of this amount approximately $326,000 was sold before the law went into effect and only $162,500 since the first of August, 1925.

The legislature also passed a bill that appropriated $10,000 to be used in investigating the possibility of the resumption of hydraulic mining. A joint study by the State mineralogist and the California Débris Commission was started during the year, and a report will be made to the governor in December, 1926.

Mine production of gold, silver, copper, lead, and zinc in California in 1925

County	Ore and tailings treated (short tons)	Lode-mine gold		Placer gold		Total gold	
		Fine ounces	Value	Fine ounces	Value	Fine ounces	Value
Alpine	5	10.60	$219			10.60	$219
Amador	366,605	112,544.57	2,326,503	561.06	$11,598	113,105.63	2,338,101
Butte	14,556	5,196.95	107,430	11,990.17	247,859	17,187.12	355,289
Calaveras	222,438	28,820.23	595,767	2,741.22	56,666	31,561.45	652,433
Del Norte				32.95	681	32.95	681
Eldorado	1,921	1,304.25	26,961	641.02	13,251	1,945.27	40,212
Fresno	33	22.20	459	1,189.86	24,597	1,212.06	25,056
Humboldt				635.75	13,142	635.75	13,142
Inyo	18,126	2,092.93	43,265	24.63	509	2,117.56	43,774
Kern	7,631	6,497.91	134,324	59.07	1,221	6,556.98	135,545
Lassen	75	54.64	1,130			54.64	1,130
Los Angeles	716			19.79	409	19.79	409
Madera	104	110.15	2,277	4.29	89	114.44	2,366
Mariposa	12,593	9,025.47	186,573	301.71	6,237	9,327.18	192,810
Merced				14.00	289	14.00	289
Mono	110	266.19	5,503			266.19	5,503
Monterey	125	48.28	998			48.28	998
Napa	275	9.44	195			9.44	195
Nevada	195,961	109,964.57	2,273,169	1,569.17	32,438	111,533.74	2,305,607
Orange	394	2.50	52			2.50	52
Placer	6,591	3,589.38	74,199	2,301.95	47,586	5,891.33	121,785
Plumas	676,632	10,900.29	225,329	1,171.20	24,211	12,071.49	249,540
Riverside	320	178.34	3,687			178.34	3,687
Sacramento				62,999.73	1,302,320	62,999.73	1,302,320
San Bernardino	82,677	7,612.97	157,374			7,612.97	157,374
San Diego	230	195.16	4,034	53.22	1,100	248.38	5,134
San Luis Obispo				40.62	840	40.62	840
Shasta	248,165	8,116.80	167,789	3,251.96	67,224	11,368.76	235,013
Sierra	37,738	64,928.76	1,342,197	1,524.21	31,508	66,452.97	1,373,705
Siskiyou	1,204	5,747.01	118,801	2,966.30	61,319	8,713.31	180,120
Stanislaus				8,308.04	171,742	8,308.04	171,742
Trinity	10,735	892.14	18,442	19,620.67	405,595	20,512.81	424,037
Tuolumne	32,569	7,244.25	149,752	282.51	5,840	7,526.76	155,592
Yuba	150	133.37	2,757	124,220.86	2,567,873	124,354.23	2,570,630
	1,938,679	385,509.35	7,969,186	246,525.96	5,096,144	632,035.31	13,065,330
Increase or decrease from 1924	—80,521	—28,667.86	—592,617	+24,563.45	+507,772	—4,104.41	—84,845

County	Lode-mine silver		Placer silver		Total silver	
	Fine ounces	Value	Fine ounces	Value	Fine ounces	Value
Alpine	2	$1			2	$1
Amador	23,162	16,074	70	$49	23,232	16,123
Butte	5,313	3,687	961	667	6,274	4,354
Calaveras	11,797	8,187	197	137	11,994	8,324
Del Norte			2	1	2	1
Eldorado	251	174	92	64	343	238
Fresno	4	3	213	148	217	151
Humboldt			90	62	90	62
Inyo	169,673	117,753	15	10	169,688	117,763
Kern	10,728	7,445	14	10	10,742	7,455
Lassen	34	24			34	24
Los Angeles	22,251	15,442	3	2	22,254	15,444
Madera	117	81	1	1	118	82
Mariposa	2,483	1,723	50	35	2,533	1,758
Merced			2	1	2	1
Mono	2,291	1,590			2,291	1,590
Monterey	4	3			4	3
Napa	2,046	1,420			2,046	1,420
Nevada	46,230	32,084	103	71	46,333	32,155
Orange	1,433	995			1,433	995
Placer	606	421	287	199	893	620
Plumas	423,870	294,166	127	88	423,997	294,254
Riverside	3,703	2,570			3,703	2,570
Sacramento			2,767	1,920	2,767	1,920
San Bernardino	1,986,155	1,378,392			1,986,155	1,378,392
San Diego	80	56	3	2	83	58
San Luis Obispo			10	7	10	7
Shasta	300,498	208,546	392	272	300,890	208,818
Sierra	12,695	8,810	157	109	12,852	8,919
Siskiyou	711	493	487	338	1,198	831
Stanislaus			1,000	694	1,000	694
Trinity	8,850	6,142	2,279	1,582	11,129	7,724
Tuolumne	845	586	40	28	885	614
Yuba	5	3	9,217	6,397	9,222	6,400
	3,035,837	2,106,871	18,579	12,894	3,054,416	2,119,765
Increase or decrease from 1924	−502,606	−263,886	+1,889	+1,712	−500,717	−262,174

Mine production of gold, silver, copper, lead, and zinc in California in 1925—Continued

County	Copper		Lead		Zinc		Total value
	Pounds	Value	Pounds	Value	Pounds	Value	
Alpine							$220
Amador							2,354,224
Butte	307	$44	725	$63			359,750
Calaveras	4,893,414	694,865					1,355,622
Del Norte							682
Eldorado							40,450
Fresno							25,207
Humboldt							13,204
Inyo	46,098	6,546	6,196,020	539,054	149,822	$11,386	718,523
Kern			442	38			143,038
Lassen							1,154
Los Angeles			150,820	13,121	199,420	15,156	44,130
Madera							2,448
Mariposa							194,568
Merced							290
Mono	893	127	14,044	1,222			8,442
Monterey							1,001
Napa							1,615
Nevada							2,337,762
Orange			3,027	263	70,920	5,390	6,700
Placer							122,405
Plumas	26,917,873	3,822,338					4,366,132
Riverside	11,036	1,567	115,491	10,048			17,872
Sacramento							1,304,240
San Bernardino	4,269	606	85,631	7,450			1,543,822
San Diego							5,192
San Luis Obispo							847
Shasta	14,551,257	2,066,278			11,069,075	811,250	3,351,359
Sierra							1,382,624
Siskiyou							180,951
Stanislaus							172,436
Trinity	439,766	62,447					494,208
Tuolumne							156,206
Yuba							2,577,030
	46,864,913	6,654,818	6,566,200	571,259	11,489,237	873,182	23,284,354
Increase or decrease from 1924	−5,242,258	−171,221	+1,802,394	+190,155	+8,429,237	+674,282	+346,197

Placer output of gold and silver in California in 1925

County	Dredge		Drift		Hydraulic		Surface		Total value
	Gold	Silver	Gold	Silver	Gold	Silver	Gold	Silver	
		Fine ounces		*Fine ounces*		*Fine ounces*		*Fine ounces*	
Amador					$10,420	62	$1,178	8	$11,647
Butte	$235,554	892	$2,052	12			10,253	57	248,526
Calaveras	49,888	161	3,739	14			3,039	22	56,803
Del Norte							681	2	682
Eldorado			4,072	10			9,179	82	13,315
Fresno							24,597	213	24,745
Humboldt					13,142	90			13,204
Inyo							509	15	519
Kern							1,221	14	1,231
Los Angeles							409	3	411
Madera							89	1	90
Mariposa			434	3			5,803	47	6,272
Merced							289	2	290
Nevada			12,216	62	19,611	36	611	5	32,509
Placer	22,673	133	16,882	91			8,031	63	47,785
Plumas			9,403	43	7,170	35	7,578	49	24,299
Sacramento	1,300,486	2,761	1,694	5			140	1	1,304,240
San Diego							1,100	3	1,102
San Luis Obispo							840	10	847
Shasta	57,176	324	322	2	425	1	9,301	65	67,496
Sierra			4,886	57	24,542	84	2,080	16	31,617
Siskiyou					53,613	426	7,706	61	61,657
Stanislaus	167,097	972					4,645	28	172,436
Trinity	357,303	2,043	969	6	46,045	223	1,278	7	407,177
Tuolumne			5,840	40					5,868
Yuba	2,560,665	9,192	3,954	13	377	1	2,877	11	2,574,270
	4,750,842	16,478	66,523	358	175,345	958	103,434	785	5,109,038
Increase or decrease from 1924	+445,321	+1,685	−32,045	−202	+115,150	+549	−20,654	−143	+509,484

REVIEW BY COUNTIES

ALPINE COUNTY

At the Advance, Alhambra, and Crown Point claims in the Monitor, Hope Valley, and Mogul districts, respectively, west of Minden, Nev., prospecting was under way in 1925, and a few tons of ore were milled. The Colossus Silver & Gold Mines Association began reopening the old Colossus and Leviathan properties in the Monitor district, which have been idle for many years.

AMADOR COUNTY

At Amador City lessees worked the Amador Queen No. 2. The Fremont-Gover was operated by the Black Hills Fremont Co. until June and yielded some rich ore close to the surface.

Near Jackson the Argonaut, Kennedy, and Moore mines were large producers, and some bullion was produced at the De Witt, Sunset, and Valparaiso. At the Argonaut the shaft was sunk to 5,345 feet, a new ore body was opened on the 4,950-foot level, and after July the mill was in full operation. The Kennedy continued to produce at a normal rate and late in the year was said to be in good ore on the lower levels. The Moore mine was refinanced, control passing to F. H. Rindge, of Stockton, and options were taken on adjoining ground. The shaft was enlarged to three compartments and deepened, and a new double-drum hoist and a compressor were installed. The De Witt mine was worked by prospectors for a few months and then abandoned. The Sunset mine was worked by its owner until March; it was then taken over by the Sierra Metals Corporation, which began development but did no milling. The Amador Metals Co. ran its custom cyanide plant on tailings from the Argonaut and concentrates from various mines in the county. The Hoodoo Mining Co. was engaged in prospecting a buried gravel channel on the Raggio ranch near Jackson.

The properties of the Plymouth Consolidated Gold Mines (Ltd.) at Plymouth were bought by the Argonaut Mining Co. early in the summer and after a few months' close-down were put on a producing basis. The Central Eureka at Sutter Creek had a successful year, getting most of its ore below the 4,250-foot level. The shaft was deepened and a station cut on the 4,500-foot level. The Central Eureka Mining Co. increased its capital from $200,000 to $600,000.

At Volcano the Defender quartz mine was productive part of the year. The Moar Bros. operated the Pioneer quartz mine, and the Marklee mine was under development. The Elephant and the Union Flat hydraulic mines near Volcano and the Ludekens hydraulic near Pine Grove made larger returns than usual. Pay gravel was reported struck at the Jupiter drift mine near Volcano.

BUTTE COUNTY

The El Oro dredge at Chico dug out its ground on August 8, 1925, after many years of work. The Natomas Co. of California finished work in the Feather River field below Oroville, and its No. 1 dredge was sold to the Thurman Gold Dredging Co., which began digging

August 15 on land bought from the Yukon Gold Dredging Co. The Natomas No. 3 boat was dismantled. The American Gold dredge, operated for the last two years by the Pacific Gas & Electric Co., dug out its ground along the Feather River late in the year. Dredging on the Feather River, which began in 1898, is virtually ended, only one boat remaining of the once large fleet.

J. P. Boyle worked the Josephine quartz mine, 4 miles east of Enterprise; 100 tons of ore were milled. The South Fork mine made a similar milling. The largest producer of gold quartz ore in the county was the Surcease mine near Yankee Hill, which was worked by Latham & Goble. The ore was treated in a 40-ton all-cyanide mill, one of the few in the State. S. A. Williams worked the Triumph mine near Feather Falls and milled about 200 tons of gold ore. Over 100 ounces of gold were obtained from surface workings on quartz stringers northeast of Palermo.

Some surface placer mining was done near Berry Creek and Forbestown, and several of the drift mines on Magalia Ridge were productive. A large amount of development was done at the Royal drift mine near De Sabla, and work was carried on at the Ethel drift property near Magalia in expectation of further development and prospecting in 1926. Surface placers near Isaiah yielded more than 100 ounces of bullion.

CALAVERAS COUNTY

The Texas Mining Co. worked the Edna group of claims near Valley Springs for a few months. Several prospectors on Stanislaus and Mokelumne Rivers sold their gold at Campo Seco. The Penn Mining Co. continued recovery of cement copper at its property, but late in the year announced that the entire surface equipment would be sold and the mine abandoned. The Carson Hill Gold Mines (Inc.) continued extensive development work and milled more than 100,000 tons of ore in its combination amalgamation, concentration, and cyanidation plant. The Finnegan mine at Carson Hill was also busy. The largest mining operation in the county was that of the Calaveras Copper Co. at Copperopolis; its 100-ton reverberatory smelter and 400-ton flotation plant were continuously active and treated more than 113,000 tons of copper ore. The Isabel gold dredge on Calaveras River near Jenny Lind ran about 10 months, but the Camanche dredge was closed down for enlargement and repairs.

The Royal mine at Felix and the Bee Tree mine at Westpoint yielded gold ore. Near Murphy the Collier and Crown Point mines were prospected and yielded a few tons of gold ore each. The Fine Gold mine near Railroad Flat was a producer. A little ore sorted from the dump of the Sheep Ranch mine at Sheepranch was milled. The Washington near Sheepranch was active throughout the year, and more than 400 tons of good grade ore were milled. Experimental work on the ores of the Black Wonder mine near Mitchell Mill resulted in the saving of some bullion, and the Calaveras and Columbus mines were under examination by a San Francisco company that abandoned its work late in the year. Work at the Lone Star group was discontinued in February after a short mill run. Phillips and Mason operated with some success a property a mile from Westpoint and milled 600 tons of ore. Various prospectors in the West

point region produced a small quantity of bullion. No output was reported by quartz mines near Angels Camp or San Andreas. Surface placer mining in the vicinity of Angels Camp, Mokelumne Hill, San Andreas, and Westpoint contributed to the placer yield of the county, as did prospecting near the Bowling Green drift mine.

DEL NORTE COUNTY

The placer output recorded for Del Norte County came largely from Myrtle Creek and Smith River, where several prospectors were working.

ELDORADO COUNTY

Lessees on the Martinez mine at Eldorado produced nearly 100 ounces of gold. The Red Wing mine was productive, milling 500 tons of $10 ore. The Frog Pond mine at Garden Valley was operated by its owner, S. W. Collins, and the Coe Hill mine was productive. The Alpine mine was unwatered. Husler & Wachter, lessees of the Grit Consolidated property near Greenwood, recovered more than $1,000 in bullion from pockets. The Hines Gilbert mine was further developed and 800 tons of ore milled. The Sliger mine was further prospected. A few surface placer mines were worked near Indian Diggings and Omo. The Eldorado County Mining & Development Co. worked the Guildford mine at Poverty Point throughout the year and installed a 10-stamp mill. The Jackass mine at Pilot Hill was worked by lessees, and the Joker property produced a little bullion. Prospecting work on the Pyramid ground near Rescue resulted in the production of nearly 30 ounces of gold. The Pioneer Gold Dredging Co. opened the Hook and Ladder drift mine in Hangtown Gulch. The Hope or Landecker mine was worked.

FRESNO COUNTY

The White Cross mine near Dunlap, the Independence north of Piedra, and the Riffe near Sanger, with an output of a few tons of ore each, were the only productive quartz mines in the county. The Grant Rock & Gravel Co. and the Service Rock Co., whose plants for washing and crushing gravel are at Friant, made the largest recovery of gold in the county, each company recovering several hundred ounces of bullion as a by-product. Small placer workings along the San Joaquin River between Auberry and Friant recovered some gold.

HUMBOLDT COUNTY

No lode mines in Humboldt County reported operations in 1925. The Salstrom hydraulic mine, 1½ miles west of Orleans, was worked from the first of March to the middle of September; it produced several hundred ounces of gold. The Croton Bar and Orcutt mines had water for only short runs. The Klamath River mine, above Weitchpec, was worked in a small way by J. E. Moore.

IMPERIAL COUNTY

No mines in Imperial County were productive during 1925.

INYO COUNTY

Because of the active demand and good prices for lead and zinc there was an increase in the number of shippers of lead ore and for the first time in several years zinc ore was produced. The Big Horn mine at Ballarat continued development and shipped two cars of lead carbonate ore, carrying some silver. The Cometti gold mine near Big Pine was active for three months and milled 75 tons of gold ore. Lead ore was produced at the Montezuma mine near Big Pine. More than 300 tons of lead ore were shipped from the Mineral Point group of claims in Black Canyon, 17 miles east of Bishop, by lessees; the last operator was the New Tonopah Dividend Mining Co., which closed down the property December 17, 1925. The Cerro Gordo mines were worked during the first of the year under lease by the Natural Soda Products Co. and during the latter part of the year by the Tungsten Products Co. More than 1,100 tons of lead ore were shipped. The Estelle Mines Corporation at Keeler shipped 300 tons of lead ore during 1925, and both lead and zinc ores were produced from the company's Morning Star claim, worked by lessees. The Santa Rosa mine near Keeler was a large producer of lead ore. No ore was shipped from the Darwin mines, now controlled by American Metals (Inc.), though considerable development work was done. The Colorado or Towser mine in the Coso district was operated by A. G. Miller and produced several hundred tons of lead-zinc ore in 1925; late in the year it was sold to the American Metals company. The old La Moine mine at the north end of the Panamint Range, worked by the Buckhorn Humboldt Mining Co., shipped three cars of 50 per cent lead ore to Salt Lake Valley smelters. The Panamint Mining Co., farther south in the Panamint Range, was constructing roads and driving a long tunnel; it reported that 400,000 tons of lead ore had been blocked out during development work. Various prospectors in the Panamints made small shipments of lead ore, and several lots of lead ore were shipped from Laws and Lone-pine by prospectors in the White Mountains east of Owens Valley. The Carbonate and Queen of Sheba mines, 40 miles west of Shoshone, were under development by the Reorganized Victory Divide Mining Co. of Goldfield, Nev. The Engineers Exploration Co. worked the Ophir mine in the Slate Range district, 9 miles from Trona, and shipped more than 2,000 tons of lead ore, and blocked out a large body of milling ore during development. The Copper Queen claims, out from Trona, were leased from the Slate Range Consolidated Mining Co. in December, and a few tons of lead ore were shipped by the lessee, the New Slate Range Mines Co. The Belcher Extension Consolidated Mines Co. acquired several claims near the Ophir mine, did much development, but shipped no ore. The Tecopa Consolidated Mining Co. was the largest producer of lead ore in the State and shipped in excess of 8,500 tons of carbonate ore to the Murray and Selby smelters. Late in the year reports were received of lead discoveries out from Beatty, Nev., in what was called later the Leadfield district.

KERN COUNTY

In the Amalie district, out from Caliente, the Ferris mine was operated, and 40 tons of ore were milled. The Locarno mine near Loraine

yielded a few ounces of gold. The Zenda mine was inactive, but some development was under way at the Barbarossa. The R. A. 4 mine near Caliente was active throughout the year, and the three-stamp amalgamation mill handled 150 tons of ore. Development work at the Glen Olive mine near Bodfish resulted in a small production of gold, and the Kern River Mining Co. produced bullion from the Keyes mine before closing it down in April. The North Sumner and Beauregard mines were developed by the North Sumner Gold Mines (Inc.), but no ore was milled. The Karma Ajax, Nancy Dare, Sailor Boy, and Standard mines in the Mojave district on Soledad Peak shipped siliceous gold and silver ore to smelters. More than 1,000 tons of gold ore produced by lessees on the Yellow Dog mine were milled at the Tropico cyanide plant near Rosamond. In the Randsburg district lessees on the Ben Franklin produced nearly 500 ounces of bullion. The Butte Lode Mining Co. operated its property, and a few tons of ore from the Grand Tank claim and the Little Butte mine were milled. The King Solomon mine, operated by the San Francisco Gold Mines Co., produced 1,000 tons of ore, and lessees on the Yellow Aster milled over 1,800 tons of gold ore. The Windy mine was developed.

LASSEN COUNTY

Lessees at Hayden Hill produced over 50 ounces of gold bullion.

LOS ANGELES COUNTY

Prospectors along the San Gabriel River near Azusa saved a few ounces of gold by placer mining. At the Monte Cristo group, out from Acton, development work was under way, and a small roasting furnace was built at the 5-ton cyanide mill. The Black Jack mine on Catalina Island produced lead-zinc ore. Early in the year the ore was shipped to Berkeley for flotation concentration, but late in 1925 a 100-ton flotation plant was put in operation at White's Landing, a few miles north of Avalon. Zinc concentrates were exported and lead concentrates shipped to Selby for smelting. A new vertical shaft was started at the Black Jack mine to facilitate ore extraction below the old workings.

MADERA COUNTY

Lessees on the Texas Flat mine near Coarsegold milled about 90 tons of ore in 1925. In August development on the 1,100-foot level was started to open an ore shoot 500 feet south of the shaft. A few tons of ore were milled from the Mud Springs, Riverside, Smuggler, and White Rock prospects near O'Neals.

MARIPOSA COUNTY

The Contention mine yielded about $1,500 in pocket gold. Testing during development on the Gray Eagle property resulted in a few ounces of gold. The Jumper mine at Bagby was worked in the spring and fall, producing nearly $1,000 in bullion; a small Gibson mill was installed. The Platinum King mine was active all the year. Small lots of placer gold were taken from the Merced River near

Bagby. The Original mine at Clearinghouse, the only important producer in the county, milled over 11,000 tons of ore in 1925. Very little mining was done in the vicinity of Coulterville, but a few ounces of gold were taken out during development on the Argo and Black Bess quartz mines and by placer miners on the Murphy ranch. At Hornitos some work was done at the Ruth Pierce and No. 5 mines. Milton Sutherland worked the School House mine until July and milled 225 tons of good grade ore. Near Mariposa some work was done at several properties, and gold was recovered from the Feliciana, Saxon King, and Washington mines. In the Mariposa Grant section a few lessees were producing, and most of the ore was milled at the Princeton mill. The east shaft of the Princeton was deepened, and several hundred tons of ore were milled from various parts of the mine. The Spread Eagle near Mariposa produced some good ore.

MERCED COUNTY

A few ounces of placer gold were saved during the washing of gravel from the Merced River for use in concrete.

MODOC COUNTY

No activities were reported from the properties in the High Grade or Adin districts during 1925.

MONO COUNTY

A few tons of copper and lead ore were shipped to smelters from the Blind Spring Hill district out from Benton. The Comanche Mining & Reduction Co. continued development and had several lessees working on the property. No mines at Bodie were worked, and in Lundy Canyon only a small amount of development was under way. At Masonic there was little activity except that by lessees working the upper levels of the Chemung mine. The Mono Mining Co. completed its 100-ton cyanide mill at the Silverado mine out from Sweetwater, Nev., and milled some ore from the Hull ground.

MONTEREY COUNTY

The New York mine in the Gorda district, west of Jolon, made a small milling in 1925. At other properties in the district little was done but assessment work.

NAPA COUNTY

The old Grigsby mine, 3 miles north of Calistoga, was reopened by the Palisades Mines Co. and a 50-ton cyanide plant erected.

NEVADA COUNTY

Near Graniteville several hundred ounces of bullion were produced at the Ancho and Republic mines, and development was under way at the Twin Sisters mine, where a 10-stamp mill was erected. At Grass Valley the Alta Combination drift tunnel was continued and some gold obtained from the channel by lessees. The White brothers made a small milling from the Ben Franklin. The Brunswick

resumed operations in March, 1925, and milled 12,500 tons of ore. The Empire mine was the largest producer of gold bullion in the camp, its 80-stamp mill being in full operation throughout the year. The Golden Center mine was reopened by the Valley Mining Corporation, which began unwatering the mine in April and started milling in August. The Idaho-Maryland was productive only the first four months of the year; the Idaho-Maryland Mines Co., the new operator, kept the mine unwatered during the rest of the year, but did not resume mining or milling until early in 1926.

At the North Star mine, despite extensive development, 94,600 tons of ore were milled, which came chiefly from ore bodies on and between the 6,000 and 6,600 foot levels. According to the annual report of the company this ore averaged $8.19 a ton and was produced at an average cost of $7.09 for operating. A charge of $1.45 a ton for development was added to cost of production, indicating an average loss of 35 cents a ton for operations during 1925. Underground development consisted of sinking the vertical shaft 850 feet and two inclines on the X vein more than 1,000 feet each. At Nevada City a small tonnage of ore was milled from the Champion mine, and the Camborn & Hayle Mining Co. continued development of the Sneath and Clay property. Near Washington there was a relatively large amount of development, and the Eagle Bird mine was productive.

Hydraulic mines of the county, including the Liberty Hill, Omega, and You Bet, were active, as was the Quaker Hill drift mine. Work on the drain tunnels of the Gold Lead drift at North Bloomfield and the Grizzly Ridge drift near North Columbia was continued.

ORANGE COUNTY

Development at the Blue Light lead-zinc mine continued, and some ore was shipped from upper levels worked by lessees. No work was done at the mines in Trabuco Canyon near Toro.

PLACER COUNTY

The Colfax Dredging Co. operated one dredge on the North Fork of the American River near Applegate and recovered over 1,000 ounces of gold. The California Premier Mines Corporation worked the Big Oak Tree and Rising Sun quartz mines near Colfax with some success, producing bullion and concentrates. On the Forest Hill Divide lessees on several of the drift mines saved some bullion, though much of the surface equipment at these mines was destroyed by forest fires. The Three Queens quartz mine, south of Foresthill, was under development and produced late in the year. Clean-ups were made at the Gould, Indiana, Star, Twenty One, and Welcome placer mines near Iowa Hill. At Michigan Bluff the Glenn and Home Ticket drift mines had fair runs, and several surface placer mines made small clean-ups. The American Bar quartz mine was active throughout the year and milled over 5,000 tons of ore. The Enwood Sand & Rock Co., operating a gravel-washing plant near Roseville, recovered gold as a by-product. The American Eagle Mines Co. produced gold quartz ore at its mines on the North Fork of the American River, 9 miles from Towle.

PLUMAS COUNTY

The Salmon Lake mine, out from Blairsden, was worked by George McGee, and 16 tons of ore were milled. Gold saved by drifting and sluicing at a few mines on Nelson Creek and the South Fork of the Feather River was sold through Quincy banks. At Johnsville the Plumas Eureka Annex Mining Co. operated the Jamison mine until June, when control passed to the Jamison Mine, F. J. Behneman, trustee. The new company spent the rest of the year in catching up old work and further developing the mine. The Walker copper mine on Grizzly Creek, 12 miles north of Spring Garden, milled 263,411 tons of ore, averaging 2.432 per cent copper, at the flotation plant, from which 25,079 tons of concentrates, averaging 24.731 per cent copper, were produced, according to the annual report of the Anaconda Copper Mining Co., of which the Walker Mining Co. is a subsidiary. The Curtner Bros. hydraulic mine, below the Walker, was active a few weeks. Several gold quartz mines near Spring Garden were busy during 1925, the Gold Leaf and Crown Point making the largest production. Near Quincy and Twain a few placer mines yielded approximately 300 ounces of gold. Out from La Porte the Marguerite drift mine was active throughout the year and made a good return. Most of the gold sent from La Porte was from small scattered workings. At Seneca the Sunnyside drift mine was productive, and lessees on the Shaffer property milled more than 300 tons of gold ore. The Lone Star mine, out from Greenville, was productive, but the New York and Droege mines were idle. One shipment of copper ore was made from the Rocky Point claims near Engelmine.

The Engels Copper Mining Co., the largest producer in the county, milled 411,866 tons of ore, averaging 1.979 per cent copper, from which 27,356 tons of concentrates were produced, carrying 27.758 per cent copper, 192,697 ounces of silver, and 1,466 ounces of gold. The copper extraction at the mill was 93.16 per cent. According to the annual report of the company the cost of producing copper was 12.0564 cents a pound, a reduction of 1.045 cents a pound, as compared with 1924. Mining costs were $1.25 a ton, and milling costs about 75 cents a ton in 1925. The company paid in dividends during 1925 $371,470, making the total dividends $1,070,154. At the Engels mine 5,025 feet of development was done, mostly on the eighth, ninth, and tenth levels, and the ore body was explored by drilling for 200 feet below the tenth level. In the Superior mine 7,821 feet of development was done, which proved the continuation of known ore bodies and led to the opening of at least one additional stope. The company's ore reserves are estimated at 2,437,608 tons. In the Engels body reserves are estimated as 1,653,426 tons, of which 635,526 tons are classed as probable ore; in the Superior mine, of the 784,182 tons estimated as reserve, 340,250 tons are classed as probable. The company continued experiments with the Pike process at a pilot plant at Emeryville.

RIVERSIDE COUNTY

The Black Eagle Mining Co. shipped more than 300 tons of lead ore from its property north of Mecca. Most of the mines of the county were inoperative.

SACRAMENTO COUNTY

The Turner drift mine in Blue Ravine, 5 miles from Folsom, was active in 1925, and several snipers along the American River won small lots of gold. The Natomas Co. of California had six dredges busy in the Natoma field, the No. 10 boat beginning work January 29 after it had been moved and reconstructed. During the year, the dredges of the company dug 13,475,000 cubic yards, which yielded an average of 9.84 cents a cubic yard at a cost of 6.17 cents a cubic yard.

SAN BERNARDINO COUNTY

Lead ore was shipped from the Bagdad Chase property in 1925. Near Barstow the Olympus Gold Mines Co., developing the Paradise mine, milled 150 tons of ore extracted during development and testing. A shipment of copper ore was made from the Allured group at Cima, and several shipments of lead ore were made from the Clark Mountains by prospectors. The Bonanza King mine, in the Providence district, was productive and the Mulcahy brothers operated their cyanide plant, obtaining a good recovery of silver from the ores of the Red Cloud, Silver King, and Red Jacket properties. Two lots of gold ore from Fremont Peak were milled at the Black Hawk mill in the Randsburg district. The Black Hawk mine was not productive after April, but resumed development work in December.

The California Rand Silver produced 80,800 tons of silver ore, virtually all of which was concentrated in the company's 400-ton flotation plant, which was active throughout the year. This ore yielded 1,886,931 ounces of silver and 6,993 ounces of gold. In its annual report for the fiscal year ended July 31, 1925, the company states that 19,400 feet of development work was done, mostly in drifts and crosscuts, and that the total length of the mine openings was 15 miles. The mill extraction averaged 93.8 per cent, and the concentrates had a value of $232.18 a ton. From July 1, 1919, to August 1, 1925, the total production of the mine from 353,699 tons of ore was 39,697.41 ounces of gold and 13,017,476 ounces of silver, which had a gross value of $11,880,267.66. Total dividends paid since the opening of the mine amounted to $3,798,606. Development was in progress at the Belcher Extension, Big Four, and Flat Tire groups on the south, east, and north of the Kelly mine, but no other mines were active in the silver district during 1925.

The Gold Mountain mine near Pine Knot was operated and milled 400 tons of good ore. Several shipments of lead ore were made from the Shadow Mountains, out from Silver Lake, the Hillside and Owl Canyon mines making the largest output. The Arlington Mining Corporation did several hundred feet of development work on a group of claims on the north side of Gold Mountain southeast of Victorville and milled a few tons of ore for testing. The Leadville and Savahai mines near Vidal were worked to a small extent; the former shipped lead ore and the latter gold ore. At Yermo F. A. Shorey continued his work on the cyanidation of silver tailings.

SAN DIEGO COUNTY

In the Julian district the Lone Pine properity was inactive. The Golden Chariot was under development, and some ore was milled.

Lessees on the Eagle claim near Julian produced a few ounces of bullion. About 50 ounces of placer gold were saved at a number of small workings. The Imperial property was developed, and new, promising ore bodies were exposed at the Oriflamme mine.

SAN LUIS OBISPO COUNTY

For the first time in many years a small quantity of placer gold from San Luis Obispo County was deposited at the San Francisco mint. This gold was mined near Pozo in the southern part of the county.

SHASTA COUNTY

The Ruby Pearl mine near Castella milled a few tons of ore obtained during development. In the French Gulch district the chief work done in 1925 was at the Milkmaid and Summit Gulch mines, though development was carried on at the Evening Star, Meyers, and Sybil mines. The mines of this district produced less than 500 tons of ore during the year, but some of it was high-grade pocket ore. Only a small amount of placer gold was recovered near Igo and French Gulch. The Gardella dredge on Clear Creek was active throughout the year; according to reports, Mr. Gardella acquired additional dredge ground near Horsetown, a few miles above his present location. Near Shasta the Rocky Point and Reid mines were worked, the latter shipping siliceous ore to the Mammoth smelter until it shut down. The Triangle placer in Churntown district, 10 miles north of Redding, was worked with some success, and various small placer mines near Shasta and Schilling yielded in the aggregate about 200 ounces of gold.

The California Zinc Co. operated the Bully Hill and Rising Star mines near Winthrop and the Afterthought mine near Ingot. The tram line connecting the Afterthought mine with Bully Hill was completed in October; thereafter approximately 3,500 tons of ore from the Afterthought was shipped to the flotation plant at Bully Hill for treatment. A total of 33,291 tons of ore from all mines was treated during 1925. During the first half of the year 12,891 tons were smelted, zinc oxide being recovered. After the flotation plant began operation 20,472 tons were milled and 11,069 tons of concentrates produced. The small quantity of copper concentrates produced was shipped to Tacoma, and more than 10,000 tons of zinc concentrates were exported.

The Mountain Copper Co. continued the mining of pyrite at its Hornet mine and produced some copper ore, which was smelted, from the No. 8 and Iron Mountain mines. The U. S. Smelting, Refining & Mining Co. made a large output of copper ore from the Balaklala, Keystone, Mammoth, and Sutro mines before they closed down about midyear. The ore mined during the year was approximately 100,000 tons; most of it came from the Keystone and Mammoth. The smelter at Kennett was in partial operation until early fall. The complete plant was sold for junk in November.

SIERRA COUNTY

At Alleghany the chief producer was the Sixteen to One mine, which was active throughout the year and produced bullion valued in

excess of a million dollars. The Gold Canyon and Gold Dollar were small producers. Over 3,000 tons of ore were milled at the Oriental, and a small output of high-grade ore was made by the Plumbago and Rainbow mines. The North Star Mines Co. of Grass Valley abandoned its work on the Rainbow in October, 1925. The Yellow Jacket mill was active a month. At the Kanaka a long tunnel was being driven, and the Wonder Gold Mines was developing its property by tunnel also.

Near Downieville the Bessler mine was operated by the Golden Key Mining Co., which spent most of the year in development work and made only a short mill run. At the Sovereign Comet mine a 900-foot tunnel to develop the 400-foot level was being driven. The Ruby drift mine was productive, and some gold was recovered at the Black Bear drift mine during work on a 2,000-foot drain tunnel that reached the channel in 1925. Near Forest the Brush Creek mine was under development by the French Gulch Mining Co. The Kate Hardy was worked, and the Young America drift mine produced some bullion. The Diamond Peak Development Co., operating the Young America or Mugwump, abandoned work on the gravel channel and started developing a quartz vein exposed by the drift tunnel.

A little gold was saved by placer miners near Goodyears Bar. The Depot Hill hydraulic mine near Pike out from Camptonville was operated throughout the year. The property of the Yuba River Power Co. in the Pike region was worked under lease until July. Near Scales and Port Wine the Scales Syndicate made a short run and then abandoned the ground. The Blue Gravel Mines Consolidated started a 2,400-foot drain tunnel to develop a gravel deposit 3½ miles north of Scales.

Out from Johnsville the Four Hills mine was productive, though worked for only a short time, and the Monarch mine near Sierra City was active on a small scale. The Primrose mine was under development by the Primrose Gold Mines Corporation of Seattle. There was almost no placer mining near Sierra City in 1925 and very little at Table Rock.

SISKIYOU COUNTY

Few quartz mines were active in Siskiyou County during 1925, but an increased output of lode gold resulted from the finding of a rich pocket at the Independence mine at Happy Camp. The White Bear Mine at Black Bear made a small production, as did the K. B. F. mine at Callahan. The Hazel mine near Hornbrook was productive for part of the year, and the Indian Girl made one small milling. The McKinley group at Fort Jones was worked continuously for the first 10 months of the year, and a test milling was made. The Homestake mine at Etna Mills was bonded by the Homestake Consolidated Mines, which did 1,000 feet of development and milled 800 tons of ore. The Golden Rod at Sawyers Bar, the Fairview at Scott Bar, and the Iron Mass and Little Gem mines near Yreka were productive. Several hundred feet of development work was done on the Schroeder near Yreka, though no ore was milled.

The Advance and Victory mines in the Liberty district were under development.

Many small placer operations were active in 1925. The dumps of the Black Bear quartz mine at Black Bear were sluiced with some success. At Callahan the entire placer yield was about 25 ounces. The Banner hydraulic mine at Cecilville was worked for three months. At Forks of Salmon the Nugget Bar was worked, and the Bennett Co., after several months of preparatory work, began production. Near Fort Jones the Henry Jewett placer was worked until July and made a good run. The Lucky Bob at Gottville was operated, as were the Golden Sunset and Kunz Flat mines near Hamburg. The total yield of hydraulic mines near Hamburg was approximately 50 ounces. Near Happy Camp the Huey Hill, Lucky Strike, Nolan Bar, and several smaller mines were worked, saving a total of over 150 ounces of bullion. Near Sawyers Bar the Eddy's Gulch, Gallia, John Frank, and Paddy Cronin were the largest hydraulic operations, the total yield of the placer mines in that vicinity being approximately 875 ounces. Near Scott Bar the Quartz Hill hydraulic had a run of 108 days and made a good clean-up. In the Seiad Valley the Portuguese Flat and Abe Lincoln hydraulic properties were worked till May. At Somesbar the Ten Eyck was the largest individual producer.

STANISLAUS COUNTY

Gold produced in Stanislaus County came from the sand and gravel washing plant of the Atlas Rock Co. at Oakdale, the La Grange dredge, which was active throughout the year on Tuolumne River, and snipers along the Stanislaus River near Knights Ferry.

TRINITY COUNTY

Few quartz mines were productive in Trinity County in 1925. The United Trinity Mines was developing the Bonanza King group of claims near Carrville and milled several hundred tons of ore for test purposes. The Strode mine was worked until June. Near Coffee a few hundred feet of tunneling was done at the Golden Jubilee and Yellow Rose of Texas mines. A small mill was erected and development work carried on at the Betty Hebbard near Dedrick. At Denny the Hazel D mine was worked by F. L. and J. D. Griffith, who did several hundred feet of development and had a three-stamp mill running part time. In Eastman Gulch, out from Lewiston, a few tons of ore were milled by lessees on the Blue Jay and Venicia mines. The Island Copper Co. shipped several thousand tons of pyritic ore to the smelters from its copper mines, but unfavorable weather curtailed operations during the first part of the year. In the Minersville region the Maple quartz claim produced gold from ore taken out during development; the Trinity Mohawk was worked by lessees, a few tons of ore being milled at the Sybil mill at French Gulch.

Placer mines in Trinity County were more active than during 1924, though not many of the large hydraulic mines were productive. Near

Big Bar the Blue Jay, Spotted Pup, Michaelson, and McDonough mines were active. Near Burnt Ranch the High Line, Horseshoe Bend, and Prince Albert each recovered a few ounces. On Coffee Creek the Steves Gulch and Underground Treasure produced gold. Several small operators near Denny made a total output of more than 100 ounces. At Hayfork about 50 ounces were produced by several small operators, and the Little Klondyke Hydraulic Mining Co., of Vallejo, completed a 10,000-foot steel flume, preparatory to work in the fall. The Burger and Home Brew hydraulic mines near Helena were productive. At Junction City the China Hill, Evens Bar, Gold Dollar, and Jacobs hydraulic mines were worked in the spring. The Bed Rock Tunnel, a drift mine on Canyon Creek, yielded a few ounces of gold. Near Lewiston the Lewiston Dredging Co. and the Trinity Dredging Co. were large producers. A new hull for the Trinity Dredging Co. was under construction. Near Minersville there was only a small output of placer gold. The Estabrook dredge near Trinity Center was active throughout the year and made a good production. Near Weaverville the Steiners Flat and Poverty Point hydraulic mines were worked with good success, and the Rising Sun and Testy mines were also productive.

TUOLUMNE COUNTY

The placer output of Tuolumne County was largely won by relatively small operations tributary to Columbia, Jamestown, and Sonora. The Springfield Tunnel & Development Co. recovered gold north of Columbia, and the Saratoga Mining & Development Co. continued development of its drift mine.

Near Confidence the Geraldine mine was developed for a time by the Silver King Divide Co., but no ore was milled and work was abandoned late in the year. At the Casa Madera a 100-ton cyanide plant was erected and a few test lots of ore taken out during development were milled. The Red Cloud mine, worked by Hiatt & Collier, ran about a month. In the vicinity of Chinese Camp the McCormick mine produced more than 100 ounces of bullion from ore taken out during development, and about 100 feet of development work was done on the Golden Poppy. The Eagle Shawmut was a large producer, recovering some gold by amalgamation and shipping high-grade concentrates to Selby. Active mining at the Shawmut was discontinued in June and by November only 15 of the 70 stamps at the mill were dropping, as the company had decided to close down the property. The Clio Vindicator mine was continuously active, and the new cyanide mill made a good recovery. Near Jamestown the Norwegian and Rawhide were worked by lessees. The Fifty Five mine near Blanchard, in the extreme southwest corner of the county, was a small producer. Other productive lode mines were the Chileno, Experimental Gulch, Ham and Birney, Heslop, and Silken. The Golden Gate near Sonora was worked by Leon P. Hills. No production of importance was made by the mines near Tuolumne or Soulsbyville.

YUBA COUNTY

About 150 ounces of gold were obtained by the cyanidation of tailings and ore from the Henry George mine, an extension of the Good Title, in the Indian Ranch district near Dobbins. A few ounces of placer gold were won by snipers around Browns Valley. A dredge equipped with 5-cubic foot buckets was put in operation on Willow Creek near Camptonville by Kumle and Kassabaum; it worked 60 days in 1925. The Marysville dredge near Hammonton, sold to the Yuba Consolidated Gold Fields late in 1924, was active throughout the year. The Yuba Consolidated company operated six boats and made a large recovery of gold. Several lessees were working in the drift mines near Smartsville, and some gold was saved by snipers near Dobbins and on the Yuba River near Smartsville and Camptonville.

GOLD, SILVER, COPPER, AND LEAD IN OREGON

(MINE REPORT)

By James M. Hill[1]

PRODUCTION

The value of the gold, silver, copper, and lead produced in Oregon in 1925 was $430,753, a decrease of 36 per cent as compared with 1924. The value of the gold produced decreased 29 per cent, that of silver 11 per cent, and that of copper 85 per cent, but the value of the lead recovered was 12 times that of the lead recovered in 1924. Production in 1925 came from 53 lode mines and 94 placer mines, as compared with 43 lode mines and 71 placers in 1924.

Mine production of gold, silver, copper, and lead in Oregon, 1916–1925

Year	Number of producing mines	Ore and tailings	Gold[1]	Silver[1]	Copper	Lead	Total value
		Short tons		*Fine ounces*	*Pounds*	*Pounds*	
1916	108	159,071	$1,902,179	231,342	3,581,886	28,000	$2,937,478
1917	76	142,438	1,491,798	125,656	2,474,487	----------	2,270,874
1918	120	126,681	1,270,465	107,323	2,451,016	10,601	1,983,942
1919	78	96,173	977,845	111,121	2,214,815	----------	1,514,255
1920	67	82,156	1,017,490	82,743	2,355,276	----------	1,541,051
1921	107	40,333	882,034	42,120	174,300	----------	946,639
1922	170	27,522	531,568	151,812	1,046,525	76,970	828,894
1923	206	50,385	498,008	96,322	1,283,476	27,523	767,590
1924	114	44,842	551,842	38,103	768,395	513	678,072
1925	147	27,483	392,409	32,793	106,325	5,612	430,753

[1]Includes placer production.

Gold and silver produced at placer mines in Oregon, 1916–1925

Year	Dredge		Hydraulic and drift		Surface		Total value
	Gold	Silver	Gold	Silver	Gold	Silver	
		Fine ounces		*Fine ounces*		*Fine ounces*	
1916	$670,450	8,101	$168,980	1,001	$33,087	147	$878,603
1917	618,922	6,733	108,341	426	103	1	733,266
1918	387,740	3,336	93,654	612	16,855	154	502,351
1919	296,750	2,934	76,337	683	7,564	53	384,761
1920	358,864	3,939	88,604	889	3,649	25	456,407
1921	381,960	3,617	88,312	577	8,461	97	483,024
1922	269,994	2,452	58,537	393	17,606	166	349,148
1923	224,117	1,649	39,408	334	13,245	79	278,461
1924	291,557	2,024	21,872	161	12,153	94	327,109
1925	137,282	741	27,970	200	21,567	190	187,604

[1]Helen M. Gaylord, of the Bureau of Mines, assisted in the preparation of this report.

ORE

The quantity of ore and tailings treated in Oregon in 1925 was 27,483 tons, a decrease of 17,359 tons, as compared with 1924. There was a slight increase in the quantity of silver ore treated, but there were 5,494 tons less gold ore (exclusive of tailings) and 12,091 tons less copper ore than in the previous year. Two hundred tons of tailings were treated in 1925 and none in 1924. All of the copper ore came from Baker County, the silver ore from mines in Baker and Grant Counties, and the gold ore from mines in nine counties. Dry gold ore and tailings yielded 50 per cent of the total gold output and 96 per cent of the gold produced by lode mines; 62 per cent of the total silver produced and 64 per cent of the silver produced by lode mines; and 72 per cent of the lead produced in 1925. Silver ore was less than 1 per cent of the total ore mined, but it yielded 29 per cent of the silver and 28 per cent of the lead produced. Copper ore, 10 per cent of the total ore mined, yielded 2 per cent of the gold, 6 per cent of the silver, and 99 per cent of the copper produced in Oregon in 1925.

Ore and metals produced in Oregon in 1925

Source	Ore and tailings		Gold		Silver	
	Short tons	Per cent	Fine ounces	Per cent	Fine ounces	Per cent
Dry gold ore and tailings	24,561	89.37	9,554.34	50.33	20,369	62.11
Dry silver ore	182	.66	16.02	.08	9,352	28.52
Copper ore	2,740	9.97	375.06	1.98	1,941	5.92
Total, lode mines	27,483	100.00	9,945.42	52.39	31,662	96.55
Total placers			9,037.38	47.61	1,131	3.45
	27,483	100.00	18,982.80	100.00	32,793	100.00
Decrease from 1924	17,359		7,712.56		5,310	

Source	Copper		Lead	
	Pounds	Per cent	Pounds	Per cent
Dry gold ore	205	0.19	4,016	71.56
Dry silver ore	520	.49	1,596	28.44
Copper ore	105,600	99.32		
	106,325	100.00	5,612	100.00
Increase or decrease from 1924	−662,070		+5,099	

Value of metals from ore and tailings treated in Oregon in 1925

Kind of ore	Ore and tailings (short tons)	Total value		Average value per ton	
		In gold and silver	In all metals	In gold and silver	In all metals
Dry gold ore and tailings	24,561	$211,642	$212,020	$8.62	$8.63
Dry silver ore	182	6,821	7,034	37.48	38.65
Copper ore	2,740	9,100	24,095	3.32	8.79
	27,483	227,563	243,149	8.28	8.85

Dry gold ore[1] sold or treated in Oregon in 1925, with content in terms of recovered metals

County	Ore[1]	Gold	Silver	Copper	Lead
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*
Baker	21,764	4,808.62	9,020	205	483
Curry	1	6.97	2		
Grant	1,198	1,598.40	6,954		
Harney	10	7.02	1		
Jackson	779	815.54	350		3,533
Josephine	279	2,041.71	245		
Lane	78	63.48	29		
Linn	125	42.96	36		
Malheur	127	95.67	74		
	24,361	9,480.37	16,711	205	4,016
Increase or decrease from 1924	−5,494	+539.00	−1,641	−938	+3,503

[1] Tailings excluded.

GOLD

Oregon mines produced 18,982.80 ounces of gold in 1925, as compared with 26,695.36 ounces in 1924. Lode mines yielded 52 per cent and placer mines 48 per cent of the total, as compared with 41 per cent and 59 per cent in 1924. The production of gold from lode mines in 1925 was 9,945.42 ounces, a decrease of 9 per cent, as compared with the previous year. There was an increased yield of gold from gold ore of 539 ounces and from silver ore of 13.82 ounces, but a decrease of 1,626.69 ounces of gold derived from copper ore, as compared with 1924. The yield of gold from placer mines declined 43 per cent. Dredge yield decreased 53 per cent, but dredges produced 73 per cent of the gold saved at placer mines in 1925. Hydraulic and drift mines produced 28 per cent more gold and surface placers 77 per cent more than in 1924.

Baker County continued to lead in gold output, though its production in 1925 was 6,917.68 ounces less than in 1924. Grant County was second, with an output of 5,398.99 ounces, which was 2,881.90 ounces less than in the year before. These losses were in part due to a curtailment of dredging, but also to the smaller output of the lode mines of these counties. Josephine County mines produced 1,798.47 ounces more gold and Jackson County mines 649.64 ounces more than in 1924, largely through increased yield of their quartz mines, though placer mines in Josephine County were more productive than in the previous year.

The five largest gold-producing mines in the State, in order of output, were the Cornucopia (quartz), the Empire (dredge), Superior (dredge), the Buffalo-Monitor (quartz), in Baker and Grant Counties, and the Progressive (quartz), in Josephine County. They produced 73 per cent of the total gold output of Oregon in 1925.

SILVER

In 1925 the production of silver in Oregon was 32,793 ounces, valued at $22,758, a decrease of 14 per cent in quantity and 11 per cent in value as compared with 1924. Lode mines yielded 97 per cent and placer mines 3 per cent of the total output in 1925. Production of silver in Baker County decreased 6,285 ounces, largely because of the great decrease in copper ore mined at the Homestead Iron Dyke, for

the silver ore shipped from the Bay Horse mine yielded more silver than that shipped in 1924. The silver output of Grant County was largely from the Buffalo-Monitor and La Belleview mines. Gold ore and tailings yielded 62 per cent, silver ore 29 per cent, and copper ore 6 per cent of the silver produced in 1925. Seven mines, with a production of over 1,000 ounces of silver each, contributed 92 per cent of the total silver yield of the State.

COPPER

There were 106,325 pounds of copper produced in Oregon in 1925, valued at $15,098, a decrease of 86 per cent in quantity and 85 per cent in value as compared with 1924. The Homestead Iron Dyke mine was worked only three months. All of the copper produced was from Baker County, and 99 per cent of it was from copper ore, a few hundred pounds being recovered from gold and silver ores.

LEAD

In 1925 the production of lead was 5,612 pounds, valued at $488, as compared with a yield of 513 pounds, valued at $41, in 1924. This lead came from concentrates from gold ore mined in Jackson County and from silver and gold smelting ores mined in Baker County.

METALLURGIC INDUSTRY

During 1925 Oregon gold mills treated 24,135 tons of ore and produced 1,583.72 ounces more gold and 277 ounces less silver than the previous year from 23,178 tons of similar material. Gold recovered from ore by amalgamation increased 2,003.19 ounces and silver increased 745 ounces, but the recovery of gold at cyanide plants decreased 419.47 ounces and that of silver 1,022 ounces. During 1925 there were 73.97 ounces of gold and 3,659 ounces of silver recovered from materials classed as tailings.

Concentrates recovered and smelted in 1925 amounted to 636 tons, of which 548 tons were copper concentrate, averaging 0.68 ounce gold and 3.54 ounces silver per ton and 9.64 per cent copper, and 88 tons were concentrates produced from gold ore, and averaged 6.04 ounces gold and 33.67 ounces silver per ton and 2.01 per cent lead.

During the year 225 tons of dry gold ore were shipped direct to smelters and yielded 1,153.67 ounces of gold, 6,736 ounces of silver, 205 pounds of copper, and 483 pounds of lead. This ore came from Baker, Curry, Grant, and Malheur Counties. Silver smelting ore produced in Baker and Grant Counties amounted to 182 tons and yielded 16.02 ounces of gold, 9,352 ounces of silver, 520 pounds of copper, and 1,596 pounds of lead.

Metallurgic recovery of metals in Oregon in 1925

Method of recovery	Material treated	Gold	Silver	Copper	Lead
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*
Ore amalgamated	4,259	3,929.03	1,146		
Ore cyanided	19,876	3,866.13	5,865		
Tailings amalgamated	200	73.97	3,659		
Ore smelted	407	1,169.69	16,088	725	2,079
Concentrates smelted	636	906.60	4,904	105,600	3,533
		9,945.42	31,662	106,325	5,612

Gold and silver produced at mills in Oregon in 1925

County	Ore to gold and silver mills[1]	Gold in bullion	Silver in bullion
	Short tons	*Fine ounces*	*Fine ounces*
Baker	21,718	4,552.88	6,457
Grant	1,021	310.86	118
Harney	10	7.02	1
Jackson	779	699.15	112
Josephine	278	2,035.17	243
Lane	78	63.48	29
Linn	125	42.96	36
Malheur	126	83.64	15
	24,135	7,795.16	7,011
Increase or decrease from 1924	+957	+1,583.72	−277

[1] Tailings excluded.

Metals produced from Oregon concentrates in 1925

BY COUNTIES

	Ore to concentrating mills	Concentrates	Gold	Silver	Copper	Lead
	Short tons	*Short tons*	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*
Baker	2,740	548	375.06	1,941	105,600	
Grant		58	408.61	2,723		
Jackson		30	116.39	238		3,533
Josephine	1	(1)	6.54	2		
	2,741	636	906.60	4,904	105,600	3,533
Increase or decrease from 1924	−18,492	−3,391	−3,270.15	−15,484	−651,950	+3,533

BY KINDS OF CONCENTRATES

Dry gold	88	531.54	2,963		3,533
Copper	548	375.06	1,941	105,600	
	636	906.60	4,904	105,600	3,533

AVERAGE RECOVERABLE CONTENT

	Fine ounces per ton	*Fine ounces per ton*	*Per cent*	*Per cent*
Dry gold	6.04	33.67		2.01
Copper	.68	3.54	9.64	
Average	1.43	7.71	8.30	.28

[1] Less than one-half ton.

Metals produced from Oregon crude ore shipped to smelters in 1925

BY COUNTIES

	Crude ore	Gold	Silver	Copper	Lead
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*
Baker	216	255.74	11,363	725	2,079
Curry	1	6.97	2		
Grant	189	894.95	4,664		
Malheur	1	12.03	59		
	407	1,169.69	16,088	725	2,079
Increase or decrease from 1924	−24	+612.56	+7,940	−10,120	+1,566

BY KINDS OF ORE

Dry gold	225	1,153.67	6,736	205	483
Dry silver	182	16.02	9,352	520	1,596
	407	1,169.69	16,088	725	2,079

Metals produced from Oregon crude ore shipped to smelters in 1925—Continued

AVERAGE RECOVERABLE CONTENT

	Fine ounces per ton	*Fine ounces per ton*	*Per cent*	*Per cent*
Dry gold	5.13	29.94	0.05	0.11
Dry silver	.09	51.38	.14	.44
Average	2.87	39.53	.09	.26

Mine production of gold, silver, copper, and lead in Oregon in 1925

County	Ore and tailings treated (short tons)	Lode-mine gold		Placer gold		Total gold	
		Fine ounces	Value	Fine ounces	Value	Fine ounces	Value
Baker	24,874	5,226.49	$108,041	3,541.54	$73,210	8,768.03	$181,251
Coos				63.57	1,314	63.57	1,314
Curry	1	6.97	144	275.75	5,700	282.72	5,844
Douglas				72.64	1,502	72.64	1,502
Grant	1,210	1,645.58	34,017	3,753.41	77,590	5,398.99	111,607
Harney	10	7.02	145			7.02	145
Jackson	779	815.54	16,859	400.83	8,286	1,216.37	25,145
Josephine	279	2,041.71	42,206	851.42	17,600	2,893.13	59,806
Lane	78	63.48	1,312			63.48	1,312
Linn	125	42.96	888			42.96	888
Malheur	127	95.67	1,978	65.69	1,358	161.36	3,336
Marion				7.49	155	7.49	155
Wheeler				5.04	104	5.04	104
	27,483	9,945.42	205,590	9,037.38	186,819	18,982.80	392,409
Decrease from 1924	17,359	999.90	20,670	6,712.66	138,763	7,712.56	159,433

County	Lode-mine silver		Placer silver		Total silver	
	Fine ounces	Value	Fine ounces	Value	Fine ounces	Value
Baker	19,787	$13,732	509	$353	20,296	$14,085
Coos			7	5	7	5
Curry	2	1	46	32	48	33
Douglas			7	5	7	5
Grant	11,138	7,730	401	278	11,539	8,008
Harney	1	1			1	1
Jackson	350	243	58	40	408	283
Josephine	245	170	89	62	334	232
Lane	29	20			29	20
Linn	36	25			36	25
Malheur	74	51	10	7	84	58
Marion			3	2	3	2
Wheeler			1	1	1	1
	31,662	21,973	1,131	785	32,793	22,758
Decrease from 1924	4,162	2,029	1,148	742	5,310	2,771

County	Copper		Lead		Total value
	Pounds	Value	Pounds	Value	
Baker	106,325	$15,098	2,079	$181	$210,615
Coos					1,319
Curry					5,877
Douglas					1,507
Grant					119,615
Harney					146
Jackson			3,533	307	25,735
Josephine					60,038
Lane					1,332
Linn					913
Malheur					3,394
Marion					157
Wheeler					105
	106,325	15,098	5,612	488	430,753
Increase or decrease from 1924	−662,070	−85,562	+5,099	+447	−247,319

Placer output of gold and silver in Oregon in 1925

County	Dredge		Hydraulic and drift		Surface		Total value
	Gold	Silver	Gold	Silver	Gold	Silver	
		Fine ounces		*Fine ounces*		*Fine ounces*	
Baker	$62,345	362	$4,917	68	$5,948	79	$73,563
Coos					1,314	7	1,319
Curry					5,700	46	5,732
Douglas			979	4	523	3	1,507
Grant	74,937	379			2,653	22	77,868
Jackson			6,417	42	1,869	16	8,326
Josephine			15,418	78	2,182	11	17,662
Malheur			239	8	1,119	2	1,365
Marion					155	3	157
Wheeler					104	1	105
	137,282	741	27,970	200	21,567	190	187,604
Increase or decrease from 1924	−154,275	−1,283	+6,098	+39	+9.414	+96	−139,505

REVIEW BY COUNTIES

BAKER COUNTY

No ore was reported mined in the Cable Cove district in 1925, but development continued at the Baisley-Elkhorn. The Bay Horse mine in the Connor Creek district shipped a few tons of silver ore. The Cornucopia mine continued regular production of cyanide bullion, and the Big Nugget placer mine made a small production. The Homestead Iron Dyke was active only three months and was taken over by the Idaho Copper Corporation late in the year. Near Rye Valley the Black Rock, Rye Valley, and Spring Gulch placer mines were worked. A 10-stamp amalgamation mill was built at the Rainbow mine, and some material sorted from the dump was milled. Near Bridgeport operation of the Superior dredge throughout the year resulted in a good recovery, and the Burnt River Gold Dredging Co. installed a drag-line scraper. At Sparta the Gold Ridge and Mattate mines were operated. The Bonanza mine near Whitney made a small milling, and at the Ibex, out from Sumpter, 1,500 tons of gold ore were milled. In the Chicken Creek or Weatherby district, north of Lime, Rizor & Lovejoy continued work at the Gleeson mine. Development was carried on at several properties along the copper belt near Keating, but no ore was shipped or milled from the district in 1925.

COOS COUNTY

The Iowa Mining Co. worked the Sidwell mine near Bandon for several weeks and made a clean-up, but finally abandoned the property. Various beach miners near Bandon, Bullards, and Powers and the Iowa company recovered a total of 63.57 ounces of gold during 1925.

CURRY COUNTY

In Curry County the largest production came from sluicing work on the outcrop of the Golden Dream mine in the Chetco district. About 9 ounces of gold were recovered by beach miners near Sixes. One small shipment of high-grade gold ore was made from the Mule Mountain mine.

DOUGLAS COUNTY

Seven placer operators near Canyonville, Glendale, Myrtle Creek, and Riddle produced a total of 72.64 ounces of gold and 7 ounces of silver. No lode mines reported production.

GRANT COUNTY

The largest producer of gold in Grant County was the Empire dredge at John Day, which was purchased by Sanderson and Porter, of San Francisco, in August, 1925. The Punch and Judy and Sunshine placers near Canyon City yielded over 25 ounces of gold. A few ounces of gold were obtained by sluicing near Granite, Prairie City, and Quartzburg, and Chinese placer miners at John Day shipped about 60 ounces of bullion. The quartz mines of the county were not particularly active, though development was under way at a few mines near Granite. The Buffalo-Monitor, worked under lease by John A. Willson, produced over 1,000 tons of ore, part of which was milled and part shipped crude. A clean-up of material at La Belleview mine was shipped, but no mining was done in 1925 at that property. In the vicinity of Canyon City the Mother Lode, Oregon, and Snow Storm mines made a small output. In the Quartzburg district, out from Prairie City, the Equity, Utah-Oregon, and Midnight properties yielded a total of 33 tons of gold ore.

HARNEY COUNTY

A mine near Denio made a shipment of siliceous gold ore.

JACKSON COUNTY

The largest gold producer in Jackson County in 1925 was the Great I Am quartz mine in the Applegate district, which was worked by the Peter Andrews Mining Co. The most productive placer mine in the county, the Pacific (Layton) mine, is located on Ferris Gulch, also in this district. The total placer output of the Applegate district was 177.02 ounces of gold and 26 ounces of silver. Near Rogue River the Ancient River Gold Mining Co. saved some placer gold, and from the Highway, Lucky Boy, North Pole, and Smith quartz mines a total of 107 tons of gold ore was milled, which yielded 54.12 ounces of gold and 15 ounces of silver. Near Gold Hill the Boling and Messenger placer mines were productive, and gold ore was milled at the Gold Hill, Lucky Bart, and Standing Buck mines. One lot of concentrates was shipped that yielded lead as well as gold and silver. The lode mines near Jacksonville were not active, but several placer mines were operated, the largest single producer being the Sterling hydraulic. The total output of the district was 174.80 ounces of gold and 24 ounces of silver.

JOSEPHINE COUNTY

The Galice district attracted much attention in 1925 through the opening up of rich ore by Robertson Bros. at the Progressive mine. The Western Metal Mines Co. did some testing of ore from its Black Jack and Sugar Pine claims and continued development. At the Mount Reuben mine work on the deep tunnel continued, but there

was no production. The Dean and Dean, Genevieve, and Williams hydraulic mines and several small placer mines were productive, the total placer yield of the district being 211.82 ounces of gold and 20 ounces of silver. Gold was recovered from the Flanagan and Swastika placer mines near Grants Pass and some ore from the High Tariff quartz mine was milled. Near Holland the Diamond Queen and Floyd placers were productive, and a little bullion was extracted from ores of the Holland and Tip Top quartz mines. The Anderson and Wittrock placers near Kerby yielded gold, and the Fielder, Oscar Creek, and Watts hydraulic mines near Murphy made fair clean-ups. Preparations were made for reopening the Greenback mine near Leland. A small milling was made at the Yellow Horn mine. At Wolf Creek the Ruble hydraulic mine was the chief producer; 25 tons of ore were milled at the Spotted Fawn quartz mine. At Waldo the Deep Gravel and Logan hydraulic mines were the largest producers; work on the drain tunnel at the Esterly mine continued. Bullion was shipped from the Horseshoe quartz mine at Waldo.

LANE COUNTY

One mine in the Bohemia district was productive, and development was reported under way at the Ophir and Ironsides properties.

LINN COUNTY

The North Queen group in the Quartzville district, out from Gates, was developed, and over 100 tons of ore were milled in test runs.

MALHEUR COUNTY

The production of Malheur County came from three placer mines and four quartz mines in the Mormon Basin district. The Jed A. Blair mine was the most productive placer mine, and the Gold Hill mine at Malheur made the largest output of gold from quartz mines. Development work continued at the Sunday Hill mine, but no ore was milled; water level was reached, and the present mill will not handle the sulphide ore successfully.

MARION COUNTY

The Minnie E mine out from Gates, in the Elkhorn district, was inactive, but a small output of placer gold was credited to the county.

WHEELER COUNTY

One small lot of placer gold was produced near Antone in 1925, and some development work was done on a few properties in the county.

ZINC [1]

By Amy Stoll [2]

SUMMARY

Zinc produced and consumed in the United States, 1924–25, in short tons

	1924	1925
Production of primary zinc: [1]		
From domestic ore	515,831	555,631
From foreign ore	1,508	17,315
	517,339	572,946
Production of secondary zinc: [1]		
Redistilled	35,486	39,181
Remelted	23,400	22,249
	58,886	61,430
Apparent consumption of primary zinc	576,225	634,376
	448,257	500,097

[1] "Primary zinc," which is produced directly from ore, is here distinguished from "secondary zinc," which is obtained by refining zinc ashes, skimmings, drosses, and old metals. The statistics of secondary zinc are given on p. 334. Wherever in this report the word "zinc" is used without qualification it means primary zinc.

The output of primary zinc in the United States from domestic ores in 1925 was 555,631 short tons, valued at $84,456,000, at the average selling price of zinc—a gain, as compared with 1924, of 8 per cent in quantity and 26 per cent in value.

PRODUCTION

PRIMARY ZINC

Primary zinc produced in the United States, 1916–1925, in short tons

APPORTIONED ACCORDING TO SOURCE OF ORE

Year	Domestic [a]	Foreign						Total
		Australia	Canada	Europe	Mexico	South America	Total	
1916	564,338	41,958	24,376	12,714	20,694	6	[b] 104,005	668,343
1917	584,597	26,140	6,787	11,689	40,360	----------	84,976	669,573
1918	492,405	1,780	8,700	113	14,043	886	25,522	517,927
1919	452,272	630	4,007	----------	8,083	751	13,471	465,743
1920	450,045	2,235	1,583	----------	8,978	536	13,332	463,377
1921	198,232	133	521	----------	1,614	----------	2,268	200,500
1922	353,274	----------	55	----------	948	----------	1,003	354,277
1923	508,335	----------	----------	----------	2,099	----------	2,099	510,434
1924	515,831	----------	1,396	----------	112	----------	1,508	517,339
1925	555,631	----------	7,997	----------	9,318	----------	17,315	572,946

[a] The slab zinc which was rolled is included here.

[b] Includes also zinc from foreign ore, as follows: Asia, 1,905 tons; Africa, 2,352 tons.

[1] Chapters on zinc that were more than ordinarily detailed were issued in Mineral Resources for 1908, dealing largely with metallurgy; for 1915, dealing with the zinc deposits of the United States and foreign countries; and for 1918, dealing with the zinc industry in relation to the World War.

[2] Figures on imports and exports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

Primary zinc produced in the United States, 1916–1925, in short tons—Continued

APPORTIONED ACCORDING TO LOCALITY AT WHICH REDUCED

Year	Arkansas	Illinois	Kansas	Oklahoma	Pennsylvania	Other States	Total
1916	7,503	181,433	141,286	168,206	76,545	93,370	668,343
1917	25,660	172,489	76,048	204,394	86,995	103,987	669,573
1918	26,753	141,844	29,149	139,066	77,342	103,773	517,927
1919	31,437	118,458	43,942	121,988	67,521	82,397	465,743
1920	31,481	109,056	41,044	110,500	74,234	97,062	463,377
1921	15,278	48,865	16,573	41,244	36,378	42,162	200,500
1922	13,627	76,266	24,167	74,537	57,319	108,361	354,277
1923	29,870	93,239	32,006	119,744	82,003	153,572	510,434
1924	28,447	93,370	28,640	118,487	83,016	165,379	517,339
1925	27,145	109,672	25,765	138,906	99,899	171,559	572,946

DISTILLED AND ELECTROLYTIC ZINC

Secondary zinc materials, such as zinc ashes and scrap, carefully selected and redistilled, yield slab zinc of all grades, which enters the market for practically all purposes. Considerable secondary material is mixed with ore and used by some regular ore smelters. The quantity of metal so derived can be calculated by the smelters and thus eliminated from the output of primary zinc, but it is practically impossible to segregate the redistilled secondary zinc by grades or in smelter stocks. Hence, the smelter stocks as given contain some secondary zinc, and the statistics of production of zinc by grades as given in the table below likewise include secondary zinc. The quantity of secondary zinc included in the graded zinc is given in the first part of the table, which gives the source of the graded zinc by the methods of reduction.

Distilled and electrolytic zinc, primary and secondary, produced in the United States, 1916–1925, in short tons

APPORTIONED ACCORDING TO METHOD OF REDUCTION

Year	Electrolytic	Distilled primary	Redistilled secondary[1]	Total
1916	[2] 11,116	[2] 657,227	28,776	697,119
1917	[2] 25,209	[2] 644,364	16,835	686,408
1918	[2] 38,916	[2] 479,011	9,918	527,845
1919	27,056	438,687	19,748	485,491
1920	51,626	411,751	21,371	484,748
1921	11,559	188,941	17,573	218,073
1922	55,369	298,908	32,988	387,265
1923	71,088	439,346	39,434	549,868
1924	77,493	439,846	35,486	552,825
1925	79,004	493,942	39,181	612,127

[1] For total production of secondary zinc, see p. 334.

[2] Figures for distilled primary include prime western zinc refined by electrolysis, as follows: 1916, 1,800 tons; 1917, 1,701 tons; 1918, 753 tons; quantities excluded from electrolytic.

Distilled and electrolytic zinc, primary and secondary, produced in the United States, 1916–1925, in short tons—Continued

APPORTIONED ACCORDING TO GRADE

Year	Grade A (high grade)	Grade B (intermediate)	Grade C (select and brass special)	Grade D (prime western)	Total
1916	73,405	94,825	100,875	428,014	697,119
1917	97,707	69,189	148,749	370,763	686,408
1918	129,344	68,987	98,584	230,930	527,845
1919	45,377	39,173	140,917	260,024	485,491
1920	80,713	33,893	59,811	310,331	484,748
1921	24,084	4,996	47,814	141,179	218,073
1922	67,459	36,402	49,980	233,424	387,265
1923	89,739	58,513	90,456	311,157	549,868
1924	108,238	48,874	100,290	295,423	552,825
1925	111,964	49,198	81,176	369,789	612,127

ROLLED ZINC

The following table shows the quantity and value of rolled zinc produced in the United States from 1915—the first year for which figures were published in Mineral Resources—through 1925. Reports from producers show that the greatest annual production of this period was in 1925, when it exceeded the former highest production, that of 1918, by nearly 1,250 short tons. The average selling value a pound, however, was nearly 5 cents lower in 1925 than in 1918.

Zinc rolled in the United States, 1915–1925

Year	Pounds	Value	
		Total	Average
1915	91,793,209	$13,028,928	$0.142
1916	97,194,358	17,875,189	.184
1917	118,883,421	20,776,290	.175
1918	139,773,825	20,905,454	.150
1919	108,593,747	11,447,569	.105
1920	106,467,530	12,290,233	.115
1921	60,800,186	5,940,208	.098
1922	107,018,690	8,546,109	.080
1923	111,666,474	10,164,981	.091
1924	122,064,719	11,552,354	.095
1925	142,263,945	14,514,234	.102

The following table includes the imports and exports of rolled zinc taken from records of the Bureau of Foreign and Domestic Commerce. The approximate quantity of rolled zinc available annually for consumption in the United States is obtained by deducting the amount exported from the sum of the amounts produced and imported.

The average prices of grades B and C slab zinc—the grades of zinc generally rolled—are given for comparison with the average of the finished rolled zinc. The difference, or "spread," between these two figures was greatest during the war when an increased demand for sheet zinc raised its price. In 1924 and 1925 the difference amounted to 3 and 2.5 cents, respectively.

Rolled zinc available for consumption in the United States, 1924–25

	1924			1925		
	Pounds	Value		Pounds	Value	
		Total	Average		Total	Average
Sheet zinc not over 0.1 inch thick	59,033,193	$5,669,867	$0.096	60,169,425	$6,195,763	$0.103
Boiler plate and sheets over 0.1 inch thick	1,982,526	160,893	.081	2,202,347	199,435	.091
Strip and ribbon zinc	61,049,000	5,721,594	.094	79,892,173	8,119,036	.102
Total zinc rolled	122,064,719	11,552,354	.095	142,263,945	14,514,234	.102
Sheet zinc imported for consumption	712	88	.124	349	55	.158
Rolled zinc exported	7,315,144	784,728	.107	8,392,707	926,841	.110
Available for consumption	114,750,287			133,871,587		
Slab zinc, grades B and C			.065			.077
Spread			.030			.025

The following companies reported production of rolled zinc in the United States in 1925:

Producers of rolled zinc in the United States in 1925

Producer	Location of plant
American Zinc Products Co	Greencastle, Ind.
Ball Bros. Co	Muncie, Ind.
Edes Manufacturing Co	Plymouth, Mass.
Hazel-Atlas Glass Co	Wheeling, W. Va.
Hegeler Zinc Co	Danville, Ill.
Illinois Zinc Co	Peru, Ill.
Matthiessen & Hegeler Zinc Co	La Salle, Ill.
New Jersey Zinc Co	Palmerton, Pa.
The Platt Bros. & Co	Waterbury, Conn.

Six of the companies listed above have reported a production of rolled zinc throughout the 11 years for which figures have been published in Mineral Resources.

The Hegeler Zinc Co., which completed its mill during the summer of 1925, entered the ranks of rolled-zinc producers in that year.

The New Jersey Zinc Co. increased it zinc-rolling capacity by the erection of a sheet-zinc mill during the year.

ZINC DUST

The commercial production of zinc dust began in 1910 with an output of less than 100 tons. The average annual production for the years 1910 to 1915 amounted to 666 tons. The marketed production for the 10 years from 1916 to 1925 is given in the following table:

Zinc dust sold by producers in the United States, 1916–1925

Year	Prepared "blue powder"			Zinc dust "atomized"			Primary zinc recovered as zinc dust (short tons)[1]
	Short tons	Value		Short tons	Value		
		Total	Average per pound		Total	Average per pound	
1916	2,548	$1,097,397	$0.215	234	$100,620	$0.215	2,293
1917	3,989	1,322,196	.166	2,134	712,922	.167	3,590
1918	4,016	877,171	.109	3,139	815,346	.130	4,166
1919	4,083	801,366	.098	2,715	566,294	.104	3,430
1920	9,066	2,009,117	.111	2,463	555,773	.113	6,425
1921	2,006	333,390	.083	999	152,151	.076	1,380
1922	3,394	531,225	.078	3,859	573,220	.074	2,113
1923	3,676	643,766	.088	4,376	702,923	.080	2,450
1924	3,894	620,078	.080	4,063	621,221	.076	1,861
1925	[2]8,314	[2]1,500,758	[2].090	(2)	(2)	(2)	2,251

[1] The amount of secondary zinc recovered in zinc dust, 1922–1925, is shown in the table on secondary zinc, p. 334.

[2] Figures for "atomized" included under "blue powder." Bureau of Mines not at liberty to publish figures separately.

The average selling value of zinc dust, including "atomized" and "blue powder," was 9 cents a pound in 1925 as compared with 7.8 cents in 1924. The total production of zinc dust in 1925 increased 4 per cent in quantity and 21 per cent in value as compared with the preceding year.

The following companies reported the production of zinc dust in 1925:

Producers of zinc dust in the United States in 1925

Producer	Location of plant
The Alloys Co	San Francisco, Calif.
John Finn Metals Works	Do.
Grasselli Chemical Co	Clarksburg, W. Va.
New Jersey Zinc Co	Palmerton, Pa.
United States Zinc Co	Sand Springs, Okla.

ZINC PIGMENTS AND SALTS

Zinc forms the base, either in whole or in part, of three white pigments—zinc oxide, leaded zinc oxide, and lithopone. Two zinc salts, the chloride and the sulphate, are likewise made in part from ore and in part from secondary zinc. Details of the production of zinc pigments and salts and of market conditions are given in the chapter on lead and zinc pigments and salts.

The zinc content of the pigments and salts made in the United States from ore, both domestic and foreign, for the period 1916 to 1925, is given in the table below. Statistics of the secondary zinc recovered in the form of pigments and salts are given under the next heading.

Primary zinc content of zinc pigments and salts made in the United States, 1916–1925, in short tons

Year	Pigments	Salts	Year	Pigments	Salts
1916	90,276	(1)	1921	53,480	3,749
1917	97,573	(1)	1922	93,112	1,801
1918	102,778	(1)	1923	115,970	1,573
1919	96,817	3,393	1924	108,282	1,075
1920	110,695	6,284	1925	110,554	673

[1] Figures not available.

SECONDARY ZINC

The accompanying table shows the amount of secondary zinc recovered in the United States as metal and in zinc dust, zinc pigments, and zinc salts, 1922 to 1925. Further details regarding the recovery of secondary zinc are given elsewhere in Mineral Resources in the chapter on secondary metals.

Secondary zinc recovered in the United States, 1922–1925, in short tons[1]

	1922	1923	1924	1925
Secondary zinc, redistilled	32,988	39,434	35,486	39,181
Secondary zinc, remelted	36,326	25,776	23,400	22,249
Recovered zinc in alloys, excluding old brass remelted	10,250	8,630	10,500	13,300
Recovered zinc in remelted brass (estimated)	60,000	65,000	63,000	53,300
Secondary zinc recovered as metal	140,000	139,000	132,000	128,000
Secondary zinc recovered in zinc dust	3,405	3,962	5,093	5,232
Secondary zinc recovered in pigments	8,609	10,322	9,021	11,714
Secondary zinc recovered in zinc salts	9,016	10,719	10,225	10,928
Total secondary zinc	161,000	164,000	157,000	156,000

[1] See p. 329 for definition of secondary zinc.

BY-PRODUCT SULPHURIC ACID

An important by-product of zinc-smelting operations is the sulphuric acid made from the sulphur gases evolved in roasting the zinc sulphide ores preparatory to their distillation or conversion to zinc oxide or to zinc salts. Sulphur gases from zinc ores were first thus utilized by Matthiessen & Hegeler, at La Salle, Ill., in 1882, but now there are numerous acid plants using these gases. These acid plants may be at zinc smelters and zinc oxide plants, at roasting and magnetic separating plants, at the mines, or nearer the acid markets, the roasted concentrates being shipped to the smelters or to other zinc plants. Locations of plants operated in 1925 are indicated in the list of zinc-reduction plants given on page 337.

The following table gives the quantity and value of sulphuric acid of different strengths produced and sold by plants associated with zinc-blende roasting operations. Figures for 1921 and 1923 were collected by the Bureau of the Census; those for 1924 and 1925 were collected by the Bureau of Mines.

By-product sulphuric acid produced at zinc-blende roasting plants in the United States, 1921, 1923, 1924, and 1925

	1921	1923	1924	1925
Number of establishments	14	11	22	22
Acid reported as 50°–60° B.:				
Produced ..... short tons	233,136	290,370	[1] 507,208	[1] 616,171
Consumed at works ..... do	37,242	.....	[1] 32,721	[1] 31,902
Sold ..... do	195,894	290,370	[1] 464,483	[1] 599,729
Value of acid sold:				
Total	$2,155,314	$2,453,964	$4,203,619	$5,175,994
Average	$11.00	$8.45	$9.05	$8.63
Acid reported as 66° B. and stronger:				
Produced ..... short tons	72,038	76,809	[2] 354,417	[2] 388,699
Consumed at works ..... do	7,439	.....	[2] 40,484	[2] 46,781
Sold ..... do	64,599	76,809	[2] 308,951	[2] 369,974
Value of acid sold:				
Total	$1,248,654	$921,056	$4,248,640	$4,918,716
Average	$19.33	$12.00	$13.75	$13.29
Total acid sold, equivalent in 60° B.:				
Quantity ..... short tons	286,826	384,489	835,225	1,043,697
Value	$3,403,968	$3,375,020	$8,452,259	$10,094,710
Consumed at works (60° B.) ..... short tons	48,698	[3]	81,302	88,039

[1] Expressed as 60° B. [2] Expressed as 66° B. [3] Figures not available.

As shown in the preceding table, sales of by-product sulphuric acid increased 25 per cent in 1925 over 1924, whereas the average selling value per ton of the total quantity sold decreased 45 cents.

In the 22 plants whose operations for 1925 are shown above, the acid was derived wholly from the burning of zinc ores and sulphur. Two plants used sulphur only, three plants used blende only, and the remainder used both sulphur and blende. The quantity of blende and sulphur used and the production of acid from each are given below, as well as the respective values based on the average selling value of 60° B. acid.

The distribution of acid according to source, whether from zinc blende or sulphur, is based on calculation to some extent. Statistics of production by source therefore do not agree exactly with statistics of production by strengths, as given in the foregoing table, the totals showing a difference of 846 tons of 60° B. acid.

Production and value of sulphuric acid made from blende and sulphur at zinc-blende roasting plants in the United States in 1925

Number of establishments	22
Blende used ..... short tons	529,957
Acid made, equivalent in 60° B ..... do	564,339
Value at $8.63 per ton (average of sales of 60° B.)	$4,870,246
Sulphur used ..... short tons	136,678
Acid made, equivalent in 60° B ..... do	517,425
Value at $8.63 per ton (average of sales of 60° B.)	$4,465,378
Total quantity of acid made (60° B.) ..... short tons	1,081,764
Total value of acid made	$9,335,624

MINE PRODUCTION

The preceding tables, except those for sulphuric acid, give the quantity of zinc recovered either as metal by smelting and by electrolytic reduction, or in zinc dust, or as zinc in pigments and salts. The following table shows the origin of the domestic zinc that is recovered by metallurgical operations. The origin of the zinc by States is obtained more accurately from the reports of mines, because smelters necessarily treat mixtures of ores, sometimes long after they have been received, so that the actual output of metallic zinc may not correspond at all closely to the product of the mines for the

same year. The data for the tables of mine production are taken from the reports on gold, silver, copper, lead, and zinc in the different States. Deduction has been made for loss in smelting, so that the following figures represent zinc that should be recovered.

The output of recoverable zinc from mines in the United States in 1925 increased 11 per cent over that of 1924. Nearly three-fifths of the country's total mine production was from the Joplin region (Oklahoma-Kansas-Missouri). Reports show an increased production in all zinc-producing States but three—Kentucky, Montana, and New Mexico. Notable gains were made in several of the Western States. In California the increase was 275 per cent, in Utah 183 per cent, and in Idaho 104 per cent.

Mine production of recoverable zinc in the United States, 1916–1925, in short tons

State	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925
Arizona	9,839	10,447	1,135	859	729	-------	105	260	-------	3,666
Arkansas	6,815	6,691	951	189	329	15	134	148	4	43
California	7,628	5,436	2,781	236	583	423	1,506	-------	1,530	5,745
Colorado	67,143	60,158	44,567	18,610	24,395	1,189	11,629	27,076	28,364	30,811
Idaho	43,253	39,927	22,581	7,997	13,966	17	2,055	13,976	7,670	15,619
Illinois	3,404	4,267	3,792	6,788	4,720	2,426	3,124	1,266	2,512	2,724
Iowa	21	18	-------	-------	-------	-------	-------	-------	-------	-------
Kansas	12,448	20,249	30,197	47,636	61,073	36,994	56,225	100,969	105,392	118,778
Kentucky	1,096	751	315	36	9	220	142	270	492	429
Missouri	155,960	132,918	55,992	31,540	24,509	10,845	16,171	18,265	12,920	14,794
Montana	114,630	93,130	104,629	84,382	92,169	11,638	59,535	70,730	64,238	57,658
Nevada	16,222	11,154	8,362	4,502	5,349	35	1,309	7,083	5,501	7,411
New Hampshire	36	45	14	-------	-------	-------	-------	-------	-------	-------
New Jersey	111,872	121,043	102,318	92,516	78,511	56,447	73,657	75,227	84,370	89,261
New Mexico	18,285	15,100	12,025	3,797	5,007	114	2,248	8,248	10,380	9,246
New York	4,507	5,192	3,776	5,120	5,654	1,572	4,816	8,463	4,664	5,158
Oklahoma	28,754	85,835	161,401	178,410	219,727	121,372	209,682	242,421	269,137	283,371
Tennessee	26,428	28,498	21,071	23,247	19,217	9,692	15,568	15,900	14,376	16,256
Texas	116	11	-------	-------	-------	-------	-------	-------	-------	-------
Utah	14,786	10,643	9,200	2,216	4,079	35	2,560	5,665	9,281	26,306
Virginia	2,276	1,703	951	-------	-------	-------	-------	-------	2,664	2,732
Washington	847	598	19	-------	213	225	614	1,512	455	609
Wisconsin	56,803	59,742	50,014	40,765	27,285	3,390	10,952	13,211	14,027	20,230
	703,169	713,556	636,091	548,846	587,524	256,640	472,032	610,690	637,977	710,847

COMPARISON OF MINE AND SMELTER TOTALS

A comparison of the mine production of recoverable zinc and the smelter production of recovered zinc in the United States, 1907 to 1923, was given in detail in Mineral Resources of the United States, 1923. In less detailed form, the following table covers a period of 19 years and shows that the mine excess amounts to 152,626 tons, or 1.7 per cent of the total quantity recovered:

Domestic primary zinc balance sheet, 1907–1925, in short tons

Year	Recoverable zinc (mine production)	Recovered zinc (smelter production) [1]	Mine excess (+) or smelter excess (−)	Year	Recoverable zinc (mine production)	Recovered zinc (smelter production) [1]	Mine excess (+) or smelter excess (−)
1907	253,017	288,817	−35,800	1918	636,091	597,772	+38,319
1908	234,064	248,473	−14,409	1919	548,846	553,833	−4,987
1909	302,373	288,155	+14,218	1920	587,524	569,011	+18,513
1910	324,444	311,023	+13,421	1921	256,640	255,448	+1,192
1911	331,515	322,341	+9,174	1922	472,032	449,740	+22,292
1912	385,621	396,123	−10,502	1923	610,690	629,052	−18,362
1913	413,824	415,374	−1,550	1924	637,977	626,967	+11,010
1914	415,774	429,116	−13,342	1925	710,847	710,480	+367
1915	588,060	539,407	+48,653				
1916	703,169	656,906	+46,263		9,126,064	8,973,438	+152,626
1917	713,556	685,400	+28,156				

[1] Zinc in slab zinc, in pigments, salts, and zinc dust made from domestic ores, and the recoverable zinc content of exported ore.

ZINC-REDUCTION PLANTS

Zinc-smelting plants operating in the United States in 1925

Operating company (A=acid plant; not necessarily at the smelter)	Location of plant	Retorts
ARKANSAS		
Athletic Mining & Smelting Co	Fort Smith	3,328
Falcon Zinc Co	Van Buren	3,200
ILLINOIS		
American Zinc Co. of Illinois (A) (see note)	East St. Louis	5,620
Hegeler Zinc Co. (A)	Danville	5,400
Illinois Zinc Co. (A)	Peru	4,640
Matthiessen & Hegeler Zinc Co. (A)	La Salle	6,132
Mineral Point Zinc Co. (A)	Depue	9,068
Missouri Zinc Co	Beckemeyer	500
INDIANA		
Grasselli Chemical Co. (see note)	Terre Haute	4,200
KANSAS		
Edgar Zinc Co	Cherryvale	4,920
Weir Smelting Co	Caney	1,920
OKLAHOMA		
Blackwell Zinc Co. (Inc.)	Blackwell	9,600
Eagle-Picher Lead Co. (see note)	Henryetta	4,800
National Zinc Co. (see note)	Bartlesville	4,256
Quinton Spelter Co	Quinton	2,688
Tulsa Fuel & Manufacturing Co	Collinsville	3,392
United States Zinc Co	Henryetta	3,200
Do	Kusa	3,760
PENNSYLVANIA		
American Steel & Wire Co. (A)	Donora	7,904
American Zinc & Chemical Co. (A)	Langeloth	4,864
New Jersey Zinc Co. (of Pennsylvania) (A)	Palmerton	7,200
TEXAS		
United States Zinc Co	Amarillo	4,000
WEST VIRGINIA		
Grasselli Chemical Co. (see note)	Clarksburg	5,760
Do	Meadowbrook	8,400
United Zinc Smelting Corporation (A)	Moundsville	2,368
		121,120

NOTE.—The American Zinc Co. of Illinois and the Eagle-Picher Lead Co. operate acid plants in connection with their zinc oxide plants at Hillsboro, Ill. The American Zinc Oxide Co. of Columbus, Ohio, has a zinc-roasting plant and disposes of the sulphur gases to the neighboring plant of the Farmers' Fertilizer Co. The Bertha Mineral Co. operates roasting furnaces and an acid plant at Tiltonsville, Ohio. The Grasselli Chemical Co. operates acid plants in connection with its zinc-roasting furnaces at Grasselli, Ind.; at Canton, Cleveland, Lockland (near Cincinnati), and Niles, Ohio; and at New Castle, Pa. The company smelts the roasted zinc concentrates at the smelters at Terre Haute, Ind., and at Clarksburg and Meadowbrook, W. Va. The Mineral Point Zinc Co. also has an acid plant in connection with its zinc oxide plant at Mineral Point, Wis. The National Zinc Co. has roasting furnaces and an acid plant at Argentine, Kans. The National Zinc Separating Co. has an acid plant in connection with its roasting and magnetic separation plant near Cuba City, Wis.

The number of retorts at zinc smelters at the end of 1925 was 121,120 at 25 plants that had been busy some time during the year. The number of retorts in operation at these plants at the end of the year was 95,460, compared with 81,435 in operation at 24 plants at the end of 1924.

In addition to the regular retort smelters, the electrolytic zinc plant of the Anaconda Copper Mining Co., at Great Falls, Mont., was active throughout the year. A new unit went into operation at this plant early in 1926. The completion of the second unit will give the plant a capacity of 10,000 tons per month.

The following operators treated secondary materials in large graphite retorts during the year:

General Smelting Co., Philadelphia, Pa.
Morris P. Kirk & Son, Los Angeles, Calif.
Tottenville Copper Co., Tottenville, N. Y.
Trenton Smelting & Refining Co., Trenton, N. J.
Wheeling Steel Corporation, Wheeling, W. Va.

These plants were not in operation any part of the year: Fort Smith (Ark.) plant of the Fort Smith Spelter Co.; Hillsboro (Ill.) plant of the American Zinc Co. of Illinois; and Bartlesville (Okla.) plant of the Bartlesville Zinc Co.

It has been officially announced that an electrolytic zinc plant with an initial capacity of 50 tons of zinc per day will be built by the Bunker Hill & Sullivan Mining & Concentrating Co. at Kellogg, Idaho, a short distance south of the company's lead smelter.

TRADE CONDITIONS

WORLD'S PRODUCTION

The following table, prepared by L. M. Jones, of the Bureau of Mines, shows the world's smelter production of zinc from 1921 to 1925, so far as statistics are available. Official figures are used wherever possible. For countries for which official data are not yet available the figures are taken from the Yearbook of the American Bureau of Metal Statistics and other reliable sources, but the official statistics will be substituted as received.

There is always a possibility of duplication in figures showing European production, for some countries send crude zinc of poor quality to other countries for refining. Furthermore, secondary zinc is included in the figures showing the foreign production, so that to put the United States on an equal footing in the statistics it would be necessary to include in the statement of its production figures for the domestic output of secondary zinc.

World's smelter production of zinc, 1921–1925, in metric tons, by countries where smelted

Country	1921	1922	1923	1924	1925
Australia: Tasmania	1,136	23,894	41,814	47,423	46,431
Austria	240	250			
Belgium	66,150	112,290	148,080	161,700	170,860
Canada	24,035	25,533	27,238	24,896	34,892
China	1,290	406	508	203	305
Czechoslovakia	3,220	2,045	2,197	6,897	3,000
France	24,168	39,716	49,334	57,710	64,256
Germany:					
Upper Silesia	62,630	[1]36,615	([3])	([2])	([2])
Other Germany	66,472	41,535	34,945	40,910	62,494
Great Britain	5,910	18,624	31,782	39,098	38,671
Indo-China				72	1,158
Italy	527	3,082	3,681	5,959	6,478
Japan	10,374	12,526	13,780	14,069	14,100
Mexico			145	([3])	1,276
Netherlands	6,405	12,997	16,440	18,190	21,117
Norway	2,000	1,850	3,783	5,024	6,807
Poland:					
Upper Silesia	([4])	[5]42,275	83,847	76,708	98,131
Other Poland	5,000	9,126	11,831	20,000	16,293
Rhodesia, Northern					169
Russia		118	19	[6]516	[6]1,490
Spain	6,738	6,269	10,922	12,777	15,122
Sweden	3,510	1,550	1,214	3,451	4,672
United States	181,890	321,393	463,056	469,320	519,765
Yugoslavia	420	1,056	1,947	2,126	2,075
Known production	472,000	713,000	947,000	1,007,000	1,130,000

[1] First 6 months; for second 6 months see Poland.
[2] See Poland, as zinc smelters were in territory allotted to Poland.
[3] Data not available.
[4] See Germany.
[5] Second 6 months; for first 6 months see Germany.
[6] Data for operating year ended Sept. 30.

The following table, also prepared by L. M. Jones, shows the output of zinc ore by different countries in the years 1921 to 1925. The zinc content is estimated where possible, but many official reports give no information on which such an estimate could be based.

World's mine production of zinc ore and concentrates, with estimated zinc content 1921–1925, in metric tons

Country	1921		1922		1923		1924		1925	
	Ore	Zinc content	Ore	Zinc content	Ore	Zinc content	Ore	Zinc content	Ore	Zinc content
North America:										
Canada	269,801	44,814	323,043	46,709	(1)	[2]27,404	(1)	[2]44,864	(1)	[2]50,199
Mexico	(1)	1,257	(1)	6,342	41,819	18,481	(1)	18,936	(1)	45,770
United States (recoverable zinc)	(1)	232,819	(1)	428,218	(1)	554,006	(1)	578,760	(1)	644,866
South America:										
Bolivia (exports)					390	(1)	485	(1)	6,210	(1)
Europe:										
Austria[3]	103	40	30	12	1,168	472	1,227	488	1,892	777
Belgium	(1)	(1)	26	(1)	36	(1)	850	(1)	10,201	(1)
Bulgaria	(1)	(1)	75	(1)	(1)	(1)	(1)	(1)		
Czechoslovakia	1,781	(1)	1,316	(1)	25	(1)	690	(1)	(1)	(1)
France	16,249	7,500	4,660	2,000	10,940	5,090	15,072	7,000	14,765	6,600
Germany—										
Upper Silesia[4]	217,921	115,556	[5]97,990	40,589	77,691	31,782	102,513	41,667	(1)	(1)
Other Germany[4]	79,193									
Greece—										
Zinc ore	1,920	507	1,149	(1)	4,026	1,038	4,861	1,191	(1)	(1)
Zinc-lead ore	858	94	132	(1)	314	31	81	9	(1)	(1)
Italy—										
Zinc ore	63,493	26,916	94,956	40,160	132,596	52,455	151,473	58,302	177,085	68,886
Zinc-lead ore	325	23	668	132	1,711	400	855	168	1,883	426
Norway	7	3	552	248	2,226	882	1,389	633	853	327
Poland—										
Upper Silesia	(6)	(6)	227,881	(1)	213,814	(1)	236,812	(1)	[1]1,129,076	(1)
Other Poland	58,824	(1)	66,400	(1)	86,708	(1)	71,387	(1)		
Portugal	(1)	(1)	1,200	600	22	11			65	33
Russia	1,027	(1)	795	(1)	1,528	(1)	[7]1,862	(1)	[7]5,774	(1)
Spain	48,357	17,446	71,996	23,954	102,313	38,050	116,721	41,921	167,939	48,816
Sweden	29,426	11,025	38,023	14,186	41,912	15,719	47,691	17,139	51,183	18,636
United Kingdom	827	297	1,646	590	2,158	950	2,354	826	1,629	572
Yugoslavia	126	(1)	228	(1)	618	(1)	549	(1)	535	(1)
Asia:										
China (exports)	11,928	(1)	61,242	(1)	61,064	(1)	20,456	(1)	37,747	(1)
Chosen	141	(1)			(1)	(1)	1,051	(1)	3,579	(1)
India (British)	4,064	(1)	18,351	(1)	2,095	(1)	18,949	(1)	17,080	(1)
Indo-China	11,035	5,297	20,936	9,421	30,500	12,800	42,451	17,829	52,869	20,792
Japan	24,707	(1)	(1)	(1)	24,876	(1)	23,317	(1)	(1)	(1)
Africa:										
Algeria	14,550	6,693	31,439	13,500	[8]49,331	20,200	42,759	17,831	56,756	22,702
Rhodesia, Northern	18	(1)	3	(1)	73	(1)			6,298	(1)
Tunisia	4,541	1,816	8,868	3,547	12,000	4,800	14,811	5,200	[8]31,000	8,985
Union of South Africa	1,161	(1)								
Oceania: Australia, New South Wales[9]	80,973	39,000	369,518	174,000	432,887	195,000	359,326	162,000	230,161	94,000

[1] Data not available.
[2] Estimated smelter recoveries.
[3] Data relate only to zinc concentrates; lead-zinc ores and concentrates not included.
[4] Data relate to concentrates and ore sold without concentration.
[5] Exclusive of the Upper Silesian territory allocated to Poland.
[6] Included under Germany.
[7] Year ended Sept. 30.
[8] Small quantity of zinc-lead ore included.
[9] In 1924 and 1925 Queensland and Tasmania also produced zinc ores, but figures of production are not available.

IMPORTS AND EXPORTS

The following tables of imports and exports of zinc and of zinc remaining in warehouse have been compiled from the publications and records of the Bureau of Foreign and Domestic Commerce:

Zinc remaining in warehouse in the United States, December 31, 1916–1925

Year	Ore and calamine		Blocks, pigs, and old		Zinc dust	
	Zinc content (pounds)	Value	Pounds	Value	Pounds	Value
1916	57,259,940	$2,210,286	180,026	$14,301	120,921	$12,989
1917	53,997,636	1,177,680	63,545	3,949	64,812	5,710
1918	53,766,247	1,089,560				
1919	37,696,007	674,384				
1920	51,299,109	996,386				
1921	28,583,018	647,654	262,221	10,911		
1922			160,976	6,396		
1923	1,736,874	84,977	160,976	6,396	[1]2,048	[1]256
1924	12,103,110	494,605			[1]998	[1]38
1925	40,938,685	1,936,332				

[1] Includes manufactures of zinc.

Zinc imported for consumption in the United States, 1916–1925

Year	Blocks or pigs		Sheets		Old		Zinc dust		Value of manufactures	Total value
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value		
1916	21	$4,436	2	$432	612	$112,254	522	$230,380	$829	$348,331
1917	18	2,279	73	16,570	259	25,974	233	48,604	250	93,677
1918	11	2,897	(1)	29	24	2,056	16	3,552	331	8,865
1919	32	2,284	1	249	37	2,216	52	5,753	1,258	11,760
1920	(1)	17	4	614	14	1,065	17	6,207	1,746	9,649
1921	6,598	559,870	6,688	496,445	6	341	42	1,121	8,290	1,066,067
1922	40	3,327	416	59,037	46	2,403	79	5,614	9,517	79,898
1923	1	375	(1)	41	20	1,624	4	891	16,331	19,262
1924	11	1,973	(1)	88	14	1,493	59	9,241	20,089	32,884
1925	(1)	303	(1)	55	24	2,495	116	20,936	18,979	42,768

[1] Less than a ton.

General imports of zinc ore into the United States, 1916–1925, in short tons

Year	Canada		Mexico		Other countries		Total	
	Ore	Zinc content	Ore	Zinc content	Ore	Zinc content	Ore	Zinc content
1916	21,908	8,790	161,271	51,028	202,785	88,329	385,964	148,147
1917	16,559	5,155	145,358	45,697	49,678	21,622	211,595	72,474
1918	14,987	5,173	53,348	18,426	2,567	1,210	70,902	24,809
1919	10,656	3,878	33,443	11,225	4,550	1,906	48,649	17,009
1920	4,731	1,794	47,453	14,975	13,589	5,718	65,773	22,487
1921	1,471	554	6,050	2,147	18	4	7,539	2,705
1922	(1)	235	(1)	1,665	(1)	29	(1)	1,929
1923	(1)	4	(1)	3,201	(1)	18	(1)	3,223
1924			(1)	4,649			(1)	4,649
1925	(1)	3,894	(1)	9,607	(1)	35	(1)	13,536

[1] Gross weight not recorded.

General imports of old brass fit only for remanufacture into the United States, 1916–1925

[Average composition about one-third zinc and two-thirds copper]

Year	Short tons	Value	Year	Short tons	Value
1916	22,976	$6,578,809	1921	20,449	$2,373,082
1917	27,580	9,931,721	1922	71,962	10,985,308
1918	6,115	1,774,002	1923	20,395	3,992,917
1919	7,938	2,157,948	1924	4,636	698,022
1920	22,355	5,174,885	1925	5,374	772,906

High-grade willemite ore was exported from New Jersey to Europe for a number of years prior to the World War. Zinc ores from Western States were also shipped to Canada, although the amount has been small in recent years. A new phase of the zinc industry began in 1924 with the shipment abroad of several hundred tons of zinc concentrates from the Joplin district (Kansas-Missouri-Oklahoma). This industry grew rapidly in 1925, and export shipments during that year from all parts of the country amounted to 68,951 tons. Nearly 90 per cent of the total quantity was consigned to Belgium.

Domestic zinc ore and domestic manufactures of zinc exported from the United States, 1916–1925

Year	Zinc ore and concentrates		Pigs or slabs		Plates and sheets		Zinc dross		Zinc dust	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1916	78	$3,992	150,623	$46,770,901	12,512	$4,540,146	48	$10,801	[1]	[1]
1917	1,320	63,043	137,282	32,605,767	16,514	5,730,792	13,302	2,126,909	[1]	[1]
1918	62	2,480	66,369	12,469,622	13,875	4,566,756	15,816	2,238,913	[1]	[1]
1919	----------	----------	109,746	17,524,153	19,762	5,212,002	5,123	739,295	[1]	[1]
1920	----------	----------	74,046	12,495,144	11,852	2,832,993	2,445	316,637	[1]	[1]
1921	----------	----------	1,753	204,984	1,816	425,618	510	45,340	[1]	[1]
1922	1,695	33,592	26,815	2,994,625	3,217	574,491	8,412	662,080	1,998	$287,890
1923	[2] 2,804	[2]	42,131	5,961,525	3,732	764,369	[3] 14,745	[3] 1,221,986	3,679	507,289
1924	[2] 368	[2]	[4] 72,583	[4] 9,538,459	3,658	784,728	[3] 10,845	[3] 974,179	2,270	353,867
1925	68,951	3,277,118	[4] 76,351	[4] 11,654,441	4,196	926,841	15,968	1,567,697	2,242	408,017

[1] Figures not available prior to 1922.
[2] Not separately enumerated by Bureau of Foreign and Domestic Commerce in 1922 and 1923, but included with "Zinc dross"; Canadian smelters reported imports of 2,804 tons of zinc ore and concentrates from the United States in 1923; exporters from the Joplin district reported 368 tons of concentrates shipped to Belgian smelters in 1924.
[3] Exports of zinc ore and dross are lumped together, these figures include the quantity and value of zinc ore exported as shown in the first column.
[4] Exports of slab zinc made from foreign ore are not given separately but have been included with domestic exports after 1923.

Foreign zinc exported from the United States, 1916–1925

Year	Exported from warehouse			Exported in manufactures with benefit of drawback, slabs and sheets excluded (short tons)
	Blocks, pigs, and old		All other manufactures (value)	
	Short tons	Value		
1916	43,230	$8,080,442	$1,072	----------
1917	64,680	12,429,356	50	1,588
1918	20,069	3,565,127	----------	6,337
1919	12,256	1,943,507	13,071	4,533
1920	28,132	4,331,636	----------	237
1921	1,256	100,677	10,785	130
1922	3,471	429,122	30,227	1,298
1923	7,080	941,257	[1]	----------
1924	[2]	[2]	[1]	----------
1925	[2]	[2]	[1]	----------

[1] Not given separately.
[2] Exports of slab zinc made from foreign ore are not given separately but have been included with domestic exports after 1923.

Domestic brass and brass manufactures exported from the United States, 1916–1925

[Zinc content approximately 30 per cent by weight]

Year	Bars, plates, and sheets		Scrap and old		Articles made from brass (value)	Total value
	Short tons	Value	Short tons	Value		
1916	122,266	$72,683,626	3,478	$1,305,050	$241,668,081	$315,656,757
1917	164,173	101,521,426	4,149	1,758,384	136,611,299	239,891,109
1918	15,495	9,522,934	2,455	799,318	19,483,146	29,805,398
1919	3,885	2,310,561	661	176,028	11,426,289	13,912,878
1920	2,905	1,671,608	1,030	254,189	13,202,854	15,128,651
1921	1,437	741,110	2,969	405,871	7,123,366	8,270,347
1922	1,830	635,449	3,147	514,322	7,675,979	8,825,750
1923	1,733	703,503	6,587	1,198,560	6,917,901	8,819,964
1924	2,265	740,993	29,294	5,352,197	6,299,046	12,392,236
1925	3,988	1,359,594	48,189	9,889,153	7,315,707	18,564,454

Domestic and foreign zinc [1] *exported from the United States, 1924–25, by destinations*

[Figures in parentheses are not duplicated in the totals]

Destination	Slabs		Sheets	
	Short tons	Value	Short tons	Value
1924				
Africa			5	$1,327
Asia	1,685	$226,147	270	62,662
China	[2]	(37)	(23)	(7,079)
Japan	(1,223)	(167,446)	(186)	(40,834)
Philippine Islands	(9)	(1,587)	(45)	(9,740)
Australia and Oceania	28	3,807	43	14,726
Canada	547	80,552	1,007	186,414
Cuba	36	4,262	468	89,278
Europe	69,374	9,086,598	994	242,597
Belgium	(2,647)	(363,775)		
France	(10,835)	(1,486,598)	(59)	(12,602)
Italy	(5,589)	(760,272)	[2]	(183)
Spain	(129)	(19,158)	(13)	(3,851)
United Kingdom	(44,541)	(5,672,995)	(858)	(207,059)
Mexico	376	61,947	265	56,704
Panama	15	2,200	38	7,160
South America	515	71,787	454	99,946
Argentina	(381)	(52,642)	(280)	(58,505)
Brazil	(88)	(12,110)	(65)	(13,869)
Chile	(43)	(6,575)	(10)	(3,011)
Colombia	[2]	(119)	(50)	(10,991)
Ecuador			(1)	(455)
Peru	(2)	(330)	(13)	(4,212)
Other countries	7	1,159	114	23,914
	72,583	9,538,459	3,658	784,728
1925				
Africa	28	4,088	25	6,039
Asia	1,897	306,508	176	45,269
China	(1)	(357)	(21)	(8,097)
Japan	(420)	(66,049)	(92)	(20,757)
Philippine Islands	(11)	(2,042)	(46)	(10,817)
Australia and Oceania			71	22,755
Canada	695	110,796	1,535	317,088
Cuba	1	208	223	48,742
Europe	71,195	10,866,461	1,550	343,127
Belgium	(3,402)	(558,878)	[2]	(23)
France	(10,292)	(1,598,316)	(85)	(19,576)
Italy	(9,046)	(1,408,985)	(7)	(1,659)
Spain	(190)	(32,123)	(4)	(1,768)
United Kingdom	(35,548)	(5,282,088)	(1,244)	(269,897)
Mexico	491	75,741	270	52,520
Panama	20	3,577	11	2,842
South America	2,021	286,472	295	77,765
Argentina	(1,653)	(226,313)	(135)	(33,792)
Brazil	(128)	(21,688)	(38)	(13,581)
Chile	(234)	(37,451)	(28)	(6,492)
Colombia	(1)	(154)	(66)	(15,893)
Ecuador			(4)	(945)
Peru	(5)	(828)	(9)	(3,013)
Other countries	3	590	40	10,694
	76,351	11,654,441	4,196	926,841

[1] Exports of slab zinc made from foreign ore are not given separately for 1924 and 1925 but have been included with domestic exports.

[2] Less than a ton.

CONSUMPTION

APPARENT CONSUMPTION OF PRIMARY SLAB ZINC

Primary zinc consumed in the United States, 1916–1925, in short tons

	1916	1917	1918	1919	1920
Supply:					
Stock Jan. 1—					
In bonded warehouse	32	90	32		
At smelters	14,221	17,508	53,689	41,241	36,793
Production	668,343	669,573	517,927	465,743	463,377
Imports, foreign	684	257	35	70	15
Imports, domestic, returned					8,162
Total available	683,280	687,428	571,683	507,054	508,347
Withdrawn:					
Exports, foreign, from warehouse	43,230	64,680	20,069	12,256	28,132
Exports, foreign, under drawback		1,588	6,337	4,533	237
Exports, domestic	163,135	153,796	80,244	129,508	85,898
Stock Dec. 31—					
In bonded warehouse	90	32			
At smelters	17,508	53,689	41,241	36,793	71,037
Total withdrawn	223,963	273,785	147,891	183,090	185,304
Apparent consumption	459,317	413,643	423,792	323,964	323,043

	1921	1922	1923	1924	1925
Supply:					
Stock Jan. 1—					
In bonded warehouse		131	80	80	[1]
At smelters	71,037	70,321	16,810	27,808	20,754
Production	200,500	354,277	510,434	517,339	572,946
Imports, foreign	6,739	52	21	25	24
Imports, domestic, returned	731				
Total available	279,007	424,781	527,345	545,252	593,724
Withdrawn:					
Exports, foreign, from warehouse	1,256	3,471	7,080	[2]	[2]
Exports, foreign, under drawback	130	1,298			
Exports, domestic	3,569	30,032	45,863	[2] 76,241	[2] 80,547
Stock Dec. 31—					
In bonded warehouse	131	80	80	[1]	
At smelters	70,321	16,810	27,808	20,754	13,080
Total withdrawn	75,407	51,691	80,831	96,995	93,627
Apparent consumption	203,600	373,090	446,514	448,257	500,097

[1] 998 pounds.
[2] Foreign exports included under domestic exports.

CONSUMPTION OF SLAB ZINC IN HOT GALVANIZING

Statistics of the output, by the hot process, of galvanized sheets, galvanized formed products made from iron or steel sheets, and galvanized wrought-iron and steel pipe are gathered by the American Iron and Steel Institute from all the manufacturers of these products and are published yearly. Other classes of galvanized products, such as wire, barbed wire, cast and forged products, and nails, spikes, and bolts, are not taken into statistical account by the Institute. As described on pages 1071–1072 of Mineral Resources for 1918, Part I, a fairly close estimate can be formed of the quantity of zinc used in coating these reported products, and though it represents only a part of the total zinc consumed in galvanizing, a comparison of the yearly

figures gives a good idea of the relative condition of the galvanizing industry. Statistics for the principal galvanized products are given in the following table:

Galvanized sheets, pipe, etc., produced in the United States and zinc used in galvanizing them, 1921–1925, in short tons

	1921	1922	1923	1924	1925
Galvanized iron and steel sheets[1]	683,442	1,054,996	1,182,431	1,114,480	1,269,556
Galvanized formed products[1,2]	54,978	82,857	82,871	77,951	89,110
Galvanized pipe[1]	299,106	436,957	512,865	508,501	614,395
	1,037,526	1,574,810	1,778,167	1,700,932	1,973,061
Zinc used (estimated)[3]	124,500	189,000	213,000	204,000	237,000

[1] From annual statistical reports of American Iron and Steel Institute.
[2] Articles formed or stamped from iron or steel sheets and galvanized after shaping.
[3] Estimated as indicated above.

CONSUMPTION OF SLAB ZINC BY USES

The largest use of slab zinc is in galvanizing, but another large use is in making brass, and a considerable quantity is rolled into sheet zinc. For a number of years the quantity of slab zinc thus consumed has been estimated by W. R. Ingalls, formerly in the Engineering and Mining Journal and subsequently in the Yearbook of the American Bureau of Metal Statistics. The estimates for a few years are given below.

Estimated consumption of slab zinc in the United States by uses, 1919–1925, in short tons

	Galvanizing	Brass-making	Sheet zinc	Other purposes[1]	Total
1919	163,000	155,000	55,000	29,000	402,000
1920	192,000	144,000	53,200	35,000	424,200
1921	138,100	75,000	30,400	19,000	262,500
1922	205,400	145,000	53,500	36,000	439,900
1923	235,200	175,000	55,800	49,000	515,000
1924	240,000	155,000	61,000	56,000	512,000
1925	286,600	165,000	71,100	60,000	582,700

[1] Includes zinc used for the manufacture of French oxide, lithopone, atomized zinc dust, die castings slush castings, and for the desilverization of lead.

PRICES AND VALUE

The average quoted price of zinc of prime western grade at St. Louis, according to the American Metal Market, monthly review sec-
Spain
United K
Mexico
Panama
South America
Argentina
Brazil
Chile
Colombia
Ecuador
Peru
Other countries
as 7.6 cents a pound in 1925, compared with 6.3 cents in 1924. e at the beginning of the year was 7.82½ cents. It rose to nts by the middle of January. Then began a gradual decline ught it to 6.77½ cents on May 1—the lowest quotation of Quotations fluctuated considerably in May and June, and price during that period was 7.1 cents. In July quota- n upward trend which continued, with slight interrup- nd of the year. The highest price quoted during the ents, recorded in the first week of November. The e end of the year was 8.7 cents.

[1] Exports of slab zinc m
included with domestic
[2] Less than a ton.

The following table gives the average quotations on prime western zinc for immediate delivery in St. Louis, 1921 to 1925, and in London, 1925, by months:

Average monthly quoted price of zinc at St. Louis, 1921–1925, and at London, 1925, in cents a pound [1]

Month	St. Louis (for immediate delivery)					London,[2]
	1921	1922	1923	1924	1925	1925
January	5.44	4.71	6.96	6.42	7.76	8.10
February	4.95	4.50	7.25	6.76	7.51	7.79
March	4.73	4.65	7.87	6.49	7.34	7.63
April	4.75	4.91	7.32	6.13	7.00	7.42
May	4.86	5.10	6.72	5.78	6.96	7.42
June	4.44	5.35	6.05	5.79	7.00	7.41
July	4.27	5.77	6.09	5.90	7.22	7.57
August	4.19	6.24	6.35	6.18	7.59	7.95
September	4.25	6.56	6.46	6.19	7.77	8.10
October	4.61	6.85	6.30	6.33	8.33	8.62
November	4.68	7.14	6.36	6.80	8.72	8.60
December	4.84	7.12	6.25	7.38	8.71	8.30

[1] American Metal Market, monthly review section.
[2] Conversion of English quotations into American money based on average monthly rate of exchange, as recorded by the Federal Reserve Board of the Treasury.

Average weekly quoted prices of 60 per cent zinc concentrates at Joplin, Mo., and of prime western zinc at St. Louis, and quoted prices of zinc sheets, f. o. b. works, and of zinc dust, in 1925

Week ended—	Sixty per cent zinc concentrates in the Joplin region (dollars per ton) [1]	Prime western zinc in St. Louis (cents per pound) [2]	Zinc sheets (cents per pound f. o. b. works) [3]	Zinc dust (cents per pound) [4]	Week ended—	Sixty per cent zinc concentrates in the Joplin region (dollars per ton) [1]	Prime western zinc in St. Louis (cents per pound) [2]	Zinc sheets (cents per pound f. o. b. works) [3]	Zinc dust (cents per pound) [4]
Jan. 3	57.50	7.82½	11.00	8.25	July 4	50.00	7.01¼	10.25	10.25
10	58.00	7.83½	11.00	8.25	11	50.00	7.14½	10.25	10.25
17	56.00	7.88	11.00	8.25	18	50.00	7.19¼	10.25	10.25
24	52.50	7.70	11.00	8.25	25	50.00	7.29½	10.25	10.25
31	50.00	7.64	11.00	8.25	Aug. 1	52.50	7.33¾	10.25	10.25
Feb. 7	52.50	7.44¼	11.00	8.25	8	55.00	7.53½	10.25	10.25
14	53.00	7.53	11.00	8.25	15	53.00	7.55½	10.25	10.25
21	54.00	7.55½	10.50	10.00	22	53.00	7.63½	10.50	10.25
28	53.00	7.50	10.50	10.25	29	53.50	7.62¾	10.50	10.25
Mar. 7	54.00	7.41	10.50	10.25	Sept. 5	54.00	7.61¾	11.00	10.25
14	54.00	7.39½	10.50	10.25	12	54.00	7.73	11.00	10.25
21	53.00	7.34	10.50	10.25	19	55.00	7.75	10.75	10.25
28	52.00	7.32¾	10.25	10.25	26	55.00	7.86½	11.00	10.25
Apr. 4	50.00	7.06½	10.25	10.25	Oct. 3	55.00	7.88¾	11.00	10.25
11	50.00	7.12½	10.25	10.25	10	56.00	8.06	11.00	10.25
18	47.50	6.98	10.00	10.25	17	57.00	8.28⅛	11.00	10.25
25	48.50	6.90½	10.00	10.25	24	58.00	8.47½	11.35	10.25
May 2	47.50	6.91	10.00	10.25	31	58.00	8.65	11.75	10.25
9	48.50	6.90	10.00	10.25	Nov. 7	58.00	8.88	11.75	10.25
16	47.50	6.94½	10.00	10.25	14	59.00	8.70½	12.00	10.25
23	48.50	6.93¾	10.00	10.25	21	58.00	8.54½	12.00	10.25
30	49.50	7.08¾	10.00	10.25	28	58.00	8.81	12.00	10.25
June 6	48.50	7.02¾	10.00	10.25	Dec. 5	56.00	8.65	12.00	10.25
13	48.50	6.99	10.00	10.25	12	56.00	8.77	12.00	10.25
20	50.00	6.98¾	10.25	10.25	19	56.00	8.71½	12.00	10.25
27	49.00	6.99	10.25	10.25	26	56.00	8.71⅛	12.00	10.25

[1] Joplin Globe, Joplin, Mo.
[2] American Metal Market, monthly review section.
[3] Eng. and Min. Jour.-Press.
[4] Oil, Paint and Drug Reporter.

A canvass of the sales of zinc and the prices received by producers in 1925 gives 7.6 cents a pound as the average selling value of all grades. This is the figure used in calculating the value of the zinc output of the country, as shown in the following table:

Distilled and electrolytic zinc produced in the United States, 1916–1925

Year	Domestic primary		Foreign primary		Redistilled secondary		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1916	564,338	$151,243,000	104,005	$27,873,000	28,776	$7,712,000	697,119	$186,828,000
1917	584,597	119,258,000	84,976	17,335,000	16,835	3,434,000	686,408	140,027,000
1918	492,405	89,618,000	25,522	4,645,000	9,918	1,805,000	527,845	96,068,000
1919	452,272	66,032,000	13,471	1,967,000	19,748	2,883,000	485,491	70,882,000
1920	450,045	72,907,000	13,332	2,160,000	21,371	3,462,000	484,748	78,529,000
1921	198,232	19,823,000	2,268	227,000	17,573	1,757,000	218,073	21,807,000
1922	353,274	40,273,000	1,003	114,000	32,988	3,761,000	387,265	44,148,000
1923	508,335	69,134,000	2,099	285,000	39,434	5,363,000	549,868	74,782,000
1924	515,831	67,058,000	1,508	196,000	35,486	4,613,000	552,825	71,867,000
1925	555,631	84,456,000	17,315	2,632,000	39,181	5,955,000	612,127	93,043,000

The average selling values of zinc by grades based on the annual reports made by producers in the years 1916 to 1925 were as follows:

Average price of zinc, 1916–1925, by grades, in cents per pound

	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925
Grade A (high grade)	[1]23.2	14.0	11.1	8.3	8.4	5.6	6.0	7.1	6.8	7.85
Grade B (intermediate)	------	12.7	10.7	7.7	8.3	5.5	6.0	7.1	6.8	
Grade C (select and brass special)	------	9.4	8.0	7.2	8.2	4.9	5.6	6.7	6.4	7.56
Grade D (prime western)	------	9.0	7.9	7.1	8.0	4.9	5.6	6.7	6.4	
All grades	13.4	10.2	9.1	7.3	8.1	5.0	5.7	6.8	6.5	7.6
Prime western, average spot quotation at St. Louis	13.6	8.9	8.0	7.0	7.8	4.7	5.7	6.7	6.3	7.6

[1] Am. Zinc Inst. Bull., vol. 3, No. 3, p. 7, 1920; averaged from monthly prices.

COPPER

By C. E. Julihn and Helena M. Meyer[1]

INTRODUCTION

It is less true than formerly that the production of copper requires three operations—mining, smelting, and refining. All copper must be mined; but for years some Lake Superior copper has been smelted and sold as Lake copper without subsequent refining, and a steadily increasing amount of copper is being extracted from ores by leaching methods, which render smelting unnecessary. Nevertheless, it is still practicable to determine the copper production of the United States by three distinct sets of statistics which may be obtained, respectively, from the mines, the smelters, and the refineries.

These separate determinations of production are desirable because each of them has for certain purposes a particular advantage over the others. As they show different aspects of production, the three sets of figures will never agree exactly, but, taken together, they afford complete data on the output of copper.

Details of the geographic distribution of output are shown more precisely by statistics of mine production than by those of smelter and refinery production. Likewise, the character of the ores produced, their contents of copper and other valuable metals, and the treatment, other than smelting, they may have undergone can be learned accurately only from the mines themselves. On the other hand, mine statistics show only the estimated recoverable metal content of the ores.

The actual percentage of crude copper recovered from copper ores, and from other ores having a low content of copper, is shown by the smelter statistics. Lead and zinc ores, siliceous ores of the precious metals, and pyrite roasted in the manufacture of sulphuric acid often carry so little copper that the mines are not paid for it and do not report it, though these sources as a whole yield a considerable amount of copper. Another cause of difference between the figures of mine and of smelter production is the lag in time between the production and the smelting of an ore. For example, most of the ore mined in December of any year is not represented in the figures of smelter production for that year, but enters into the figures of the year following.

[1] Figures on imports and exports were compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

A third cause of difference between these two sets of figures is that the amount of metal contained in ore, matte, and other material held in stock at smelters is rarely the same at the beginning and the end of a year. Smelter statistics as well as mine statistics show broadly the geographic distribution of output.

The precise amount of copper made available for consumption in a given period, as well as that of the precious metals recovered from crude copper, is shown only by refinery statistics; but these afford little information on the distribution of output according to source, and are uncertain even in their classification of the material refined as foreign or domestic.

Differences between smelter and refinery statistics are similar in origin to those existing between mine and smelter statistics, for some time after the copper is smelted must elapse before it is refined, and the quantity of copper in stocks of untreated or unfinished material at the beginning of the year differ from that at the end, not only at smelters but at the refineries as well.

Two or three months usually elapse between the day ore is mined and the day the copper derived from it becomes available for commercial use. Hence, the refinery statistics for the calendar year 1925 represent approximately the ore mined between October, 1924, and October, 1925. In periods when the course of production is little disturbed by pronounced fluctuations of activity, the three sets of statistics should not differ greatly; but any decided fall or rise in market conditions between October of one year and March of the year following tends to accentuate the differences among the three sets of figures.

In these reports the smelter output, including that of furnace-refined Lake copper as well as blister copper, has been adopted as the production of the country because smelter figures permit reasonably accurate determination of the distribution of copper production by States and give also the actual output of copper.

In order to have these figures maintain their value for showing the output of the country, it is necessary to include in them some copper produced directly through the leaching of ores and subsequent precipitation by electrolysis, although this fraction of the production is not actually smelted, as is the cement copper precipitated from solutions by means of scrap iron. Since this electrolytically precipitated copper is very pure, refineries merely resmelt it in order to cast it in commercial forms.

SUMMARY OF DOMESTIC AND WORLD STATISTICS

Summary of statistics of the copper industry in the United States, 1916–1925

	1916	1917	1918	1919	1920
Production of copper:					
Smelter output—pounds	1,927,850,548	1,886,120,721	1,908,533,595	1,286,419,329	1,209,061,040
Mine production—do	2,005,875,312	1,895,434,349	1,910,022,841	1,212,334,041	1,224,550,151
Refinery production of new copper—					
Electrolytic—pounds	1,579,620,513	1,452,744,593	1,560,327,422	1,233,994,324	1,010,240,867
Lake—do	269,794,531	268,508,091	231,096,158	177,594,135	153,483,952
Casting and pig—do	39,337,155	152,293,487	91,450,611	21,897,336	18,698,421
Total domestic—do	1,888,752,199	1,873,546,171	1,882,874,191	1,433,485,795	1,182,423,240
Total domestic and foreign—pounds	2,259,387,315	2,421,794,213	2,394,297,521	1,770,168,041	1,526,165,346
Total new and old copper—pounds	2,959,000,000	3,189,000,000	3,100,000,000	2,345,000,000	2,151,000,000
Ore produced:					
Copper ore—short tons	57,863,365	58,482,694	62,289,069	36,121,622	36,765,370
Average yield of copper—per cent	1.70	1.60	1.51	1.65	1.63
Copper-lead and copper-zinc ores—short tons	79,992	31,632	15,698	17,632	26,890
Average price per pound—cents	24.6	27.3	24.7	18.6	18.4
Imports (unmanufactured)—pounds	462,335,980	556,420,297	575,805,115	429,387,594	485,670,691
Exports of metallic copper [1]—do	784,006,486	1,125,647,336	744,243,481	515,595,019	623,158,489
Withdrawn from total supply on domestic account:					
Total new copper—pounds	1,478,881,871	1,394,829,715	1,661,669,576	914,471,572	1,053,838,558
Total new and old copper—pounds	2,179,000,000	2,162,000,000	2,367,000,000	1,489,000,000	1,679,000,000
Stocks at end of year:					
Refined copper—do	128,055,229	114,000,000	180,000,000	631,000,000	659,000,000
Blister and materials in solution—pounds	424,000,000	411,000,000	562,000,000	273,000,000	465,000,000
World's production—do	3,037,266,000	3,150,583,000	3,148,531,000	2,191,394,000	2,114,349,000
Value of smelter production from domestic ores	$474,288,000	$514,911,000	$471,408,000	$239,274,000	$222,467,000

	1921	1922	1923	1924	1925
Production of copper:					
Smelter output—pounds	505,586,098	950,285,947	1,434,999,962	1,634,249,192	1,674,869,886
Mine production—do	466,190,853	964,583,894	1,477,739,709	1,606,165,018	1,678,117,747
Refinery production of new copper—					
Electrolytic—pounds	506,532,984	766,944,836	1,302,454,492	1,499,223,447	1,533,995,439
Lake—do	100,918,001	122,545,126	137,691,306	145,333,227	138,029,764
Casting and pig—do	1,963,271	15,180,723	24,019,197	29,657,925	10,870,144
Total domestic—do	609,414,256	904,670,685	1,464,164,995	1,674,214,599	1,682,895,347
Total domestic and foreign—pounds	950,777,815	1,255,515,959	1,979,835,616	2,260,076,010	2,204,573,824
Total new and old copper—do	1,385,000,000	1,927,000,000	2,802,000,000	3,037,000,000	3,045,000,000
Ore produced:					
Copper ore—short tons	13,396,382	26,893,247	45,519,317	49,178,315	53,103,014
Average yield of copper—per cent	1.70	1.74	1.58	1.59	1.54
Copper-lead and copper-zinc ores—short tons	14,248	52,370	162,181	219,874	228,612
Average price per pound—cents	12.9	13.5	14.7	13.1	14.2
Imports (unmanufactured)—pounds	350,472,611	541,013,220	676,473,338	768,813,731	652,971,407
Exports of metallic copper [1]—do	628,415,714	742,755,957	828,854,827	1,116,775,136	1,082,369,439
Withdrawn from total supply on domestic account:					
Total new copper—pounds	610,988,744	896,633,833	1,300,473,331	1,354,742,564	1,401,012,091
Total new and old copper—pounds	1,046,000,000	1,568,000,000	2,122,000,000	2,131,000,000	2,241,000,000
Stocks at end of year:					
Refined copper—do	459,000,000	216,000,000	264,000,000	243,000,000	124,000,000
Blister and materials in solution—pounds	283,000,000	361,000,000	432,000,000	393,000,000	432,000,000
World's production—do	1,229,277,000	1,869,866,000	2,709,615,000	2,958,753,000	3,053,995,000
Value of smelter production from domestic ores	$65,221,000	$128,289,000	$210,945,000	$214,087,000	$237,832,000

[1] Total exports of copper, exclusive of ore, concentrates, and composition metal, and in 1923, 1924, and 1925 of unrefined copper, figures for which are not separable from those for ore and concentrates.

Copper produced in the United States from domestic ores, 1920–1925

[Smelter output, in pounds fine]

State	1920	1921	1922	1923	1924	1925
Alaska	66, 093, 924	76, 808, 114	59. 900, 579	68, 648, 368	77, 053, 492	72, 204, 166
Arizona	552, 988, 731	155, 165, 656	428, 200, 634	615, 493, 561	672, 365, 115	722, 653, 457
California	11, 822, 028	15, 906, 883	20, 440, 430	27, 042, 835	49, 433, 716	46, 943, 604
Colorado	4, 282, 616	6, 592, 598	3, 635, 916	4, 343, 418	4, 158, 612	3, 163, 211
Georgia	3, 663		8, 147			
Idaho	1, 922, 116	1, 971, 623	3, 504, 944	3, 664, 079	3, 148, 519	3, 144, 064
Maine		3				
Michigan	153, 483, 952	100, 918, 001	122, 545, 126	137, 691, 306	145. 333, 227	138, 029, 764
Missouri	533, 368	137, 591	1, 070, 259	217, 449	184, 947	12, 114
Montana	177, 743, 747	49, 471, 206	165, 341, 414	224, 353, 764	249, 322, 394	270, 604, 676
Nevada	55, 580, 322	15, 129, 116	20, 398, 611	63, 495, 928	77, 281, 479	77, 137, 563
New Mexico	52, 159, 751	18, 076, 909	29, 127, 329	57, 521, 171	78, 145, 629	76, 467, 245
North Carolina				61. 913		
Oregon	2, 529, 311	274, 934	925, 954	1, 182, 437	716, 656	126, 107
Pennsylvania	618, 361		888, 721	1, 121, 573	1, 263, 535	562, 240
South Dakota	2, 190			47	4, 199	2, 336
Tennessee	16, 727, 803	15, 084, 294	14, 226, 232	18, 721, 932	18, 251, 996	19, 789, 234
Texas	14, 217	587	3, 889	4, 216	302	785
Utah	110, 357, 748	45, 831, 959	79, 665, 563	210, 118. 291	256, 531, 349	242, 730, 986
Washington	2, 125, 586	598, 658	369, 133	839, 254	978, 647	1, 184, 807
Wyoming	24, 256	9, 830		87, 686		331
Undistributed	47, 350	3, 608, 136	33, 066	390, 734	75, 378	113, 196
	1, 209, 061, 040	505, 586, 098	950, 285, 947	1, 434, 999, 962	1, 634, 249, 192	1, 674, 869, 886

World's production of copper (smelter output), 1921–1925, in metric tons [1]

[Figures are taken from official sources so far as possible. For countries from which ore or matte was exported for smelting, official figures have been converted to figures showing the quantity of copper recoverable by the smelters]

Country	1921	1922	1923	1924	1925
Canada	21, 600	19, 450	39, 409	47, 381	50, 553
Cuba [2]	8, 200	11, 400	10, 600	10, 600	14, 500
Mexico	15, 228	26, 978	53, 372	49, 113	51, 336
United States	229, 332	431, 047	650, 912	741, 283	759, 708
North America	274, 360	488, 875	754, 293	848, 377	876, 097
Bolivia	10, 592	10, 531	10, 049	7, 439	7, 235
Chile	59, 239	129, 575	182, 384	189, 571	190, 198
Peru	33, 284	36, 408	44, 166	33, 938	36, 957
Venezuela [2]	800	1, 700	900	800	1, 000
South America	103, 915	178, 214	237, 499	231, 748	235, 390
Austria	4, 277	4, 593	4, 833	3, 848	3, 379
Bulgaria [2]	600	1, 000	1, 000	1, 000	1, 000
England	73	106	89	123	97
Finland [2]	200	750	507	368	1, 300
Germany	15, 514	17, 733	18, 467	22, 944	23, 000
Italy	356	319	494	431	955
Norway	1, 348	80	67	71	251
Portugal [2]	1, 600	600	400	700	1, 000
Rumania	108	111	71	90	133
Russia	4, 668	2, 000	[2 3] 2, 000	[2 3] 3, 300	[2 3] 5, 400
Spain	36, 345	25, 139	45, 266	36, 346	39, 409
Sweden	1, 149				
Yugoslavia	4, 144	5, 354	6, 788	8, 101	7, 301
Europe	70, 382	57, 785	79, 982	77, 322	83, 225
China [4]	958	313	849	842	1, 048
India, British	1, 161	1, 054	190	1, 300	3, 364
Japan, proper	54, 092	54, 126	59, 346	62, 583	65, 692
Taiwan	1, 197	1, 096	707	227	
Asia	57, 408	56, 589	61, 092	64, 952	70, 104
Algeria [2]	300	430	460	500	400
Belgian Congo	30, 464	43, 362	57, 886	85, 570	90, 104
Rhodesia:					
Northern	200	181	132	100	75
Southern	2, 794	3, 074	2, 697	2, 565	1, 714
Southwest African Protectorate	6, 529	6, 279	9, 044	7, 744	8, 334
Union of South Africa	92	665	7, 979	8, 383	7, 819
Africa	40, 379	53, 991	78, 198	104, 862	108, 446
Australia	11, 147	12, 703	17, 997	14, 807	12, 007
Grand total	557, 591	848, 157	1, 229, 061	1, 342, 068	1, 385, 269

[1] Compiled by L. M. Jones, of the Bureau of Mines.
[2] Estimate based on official figures.
[3] Year ended Sept. 30.
[4] Exports of ingots and slabs.

GENERAL CONDITIONS

In 1925 both production and consumption of copper showed an increase over the former peace-time records of 1924. Though the average price received (14.2 cents) was lower than the pre-war price of 1913 (15.5 cents), it exceeded that of 1924 (13.1 cents) by a little more than a cent. Many companies resumed the payment of dividends and some others declared larger dividends than they had been paying. It is evident that the low selling price of copper in recent years has encouraged consumption, discouraged the search for substitutes, and resulted in the finding of many new uses for the metal. Undoubtedly substitutes would have been employed for some uses had prices been higher, whether or not such substitutes could have met requirements quite as well as copper.

Both imports and exports of copper decreased, but exports drew more heavily on domestic production than in the preceding year, because the decrease in imports was about three times that in exports. The increase in net exports, together with that in domestic consumption, caused a large decrease in stocks of refined copper; in consequence these stocks at the end of 1925 were only a little more than one-half as large as at the end of 1924. Stocks of blister copper increased, however, but this increase was only about one-third of the amount of the decrease in refined stocks.

The North Butte Co. and the Tuolumne Copper Co. merged in 1925 to effect plans for more economical mining. At the end of the year a merger of the Ray Consolidated Copper Co. (Ray and Chino interests) and the Nevada Consolidated Copper Co. was being considered.

A bill providing a duty of 6 cents a pound on imports of copper was introduced in Congress by Representative James, of Michigan, in May, 1924. In 1925 Senator Cameron, of Arizona, introduced a similar bill in the Senate. Discussion of these bills has revealed widely divergent views among copper producers.

In Africa the output of copper increased in 1925 over the previous record year of 1924. South American production was somewhat less than the record production of 1923 owing to a drop in the output of Peru, while the production of Chile made a new high record in 1925. On account of labor and transportation difficulties, although record-breaking, the output of the Union Minière du Haut-Katanga (Belgian Congo) was not as large as had been expected. Adequate and dependable working forces are difficult to obtain and, according to Letcher,[2] transport charges constitute more than half the cost of operation.

The Chile Copper Co. mined 7,778,910 tons of ore averaging 1.592 per cent copper in 1925 and produced 219,516,420 pounds of electrolytic copper at a cost of 8.369 cents per pound. Upon completion of a two-year program of construction to provide a production capacity of 240,000,000 pounds of copper annually, that company immediately started a new project of expansion to raise its annual production capacity to 350,000,000 pounds. Included in this project is the construction of a liquid-oxygen plant, by means of which the company will be able to substitute to a considerable extent blasting with liquid oxygen for blasting with high explosives.

[2] Letcher, Owen, "Katanga and its mineral development": Eng. and Min. Jour.-Press, Feb. 14, 1925, pp. 277–284.

The Braden Copper Co. maintained its production, milling 4,283,065 tons of ore that averaged 2.349 per cent copper. The yield was more than 154,000,000 pounds of copper.

In February, 1925, the Andes Copper Mining Co. resumed preparations for production. The company expects to begin producing at the end of 1926.

Cerro de Pasco Copper Corporation (Peru) settled difficulties over smelter fumes by installing a Cottrell precipitation plant and purchasing more property. Its production in 1925 was approximately 80,000,000 pounds of copper.

RECENT ADVANCES IN MINING AND METALLURGY

Improvements in mining and metallurgical practice helped to decrease the cost of producing American copper and consequently increased the ability of producers to pay larger dividends. Many of the improvements at mines and mills are mentioned in the section on operations by States and companies. By the end of 1925, for example, the Utah Copper Co. had installed 17 electrically operated shovels equipped with caterpillar tractors and had changed the flotation reagents used at the mill, substituting sodium xanthate and lime for creosote oil in combination with sulphuric acid. These changes helped to make possible the mining and milling of 12,538,000 tons of ore, containing an average of only 1.02 per cent copper, and the payment of dividends totaling $6,904,083. The plant of the Miami Copper Co. was enlarged to handle 10,000 instead of 6,800 tons of ore a day to compensate for the lower grade of ore to be mined. This company treated ore containing an average of 1.287 per cent copper, as against 1.624 per cent the year before, and during the last three months of the year treated ore averaging only 0.972 per cent copper, at a cost somewhat less than 12 cents a pound. Its reserve of higher-grade ore available for separate mining is now virtually exhausted. Ore treated at the Inspiration mill contained only 1.033 per cent copper as compared with 1.135 per cent in 1924, but mill recoveries were considerably better. Many other plants showed marked improvements in operating results, and increased ability to produce lower-grade ores at a profit has greatly enlarged the ore reserves of many mines.

At the beginning of this century it was a frequent comment that mining showed relatively few technical improvements in comparison with milling and smelting; and sometimes the suggestion was made that this must always be so because mining practice was so determined by natural conditions that the art of extracting ore from the earth's crust must inevitably remain more fixed and inflexible than that of recovering metal from an ore after its delivery at the surface.

A recent visit to most of the large copper mines and reduction plants of the Western States and Alaska, however, gave an impression of remarkable advances in all three of these arts—advances still so rapid that maintenance of their speed could hardly be expected. Everywhere important changes were evident, not only in the actual remodeling of plants and in the changes being planned by operators but through large vacant spaces in mills from which obsolete equipment had been removed, through gigantic blast-furnace plants rust-

ing in reserve, and through wider application of cheaper methods of mining.

A proper perspective for an appraisal of the magnitude, the mutual relations, and the relative importance of such changes requires consideration of a much longer period than a single year, as the most profound effects of a change in technology often occur long after the change itself has ceased to be news. This is especially true of the economic effects ensuing from changes in technology, as will be shown later.

EXPERIMENTS IN LEACHING

Old in principle but important in its present significance is the attempt to leach very low-grade "cap rock" in huge dumps, over which are distributed acid mine waters, the cheapest imaginable solvent of oxidized copper minerals; from these waters the copper is precipitated by scrap iron. At Bisbee this method has already given highly satisfactory results on large quantities of low-grade cap rock, the removal of which as overburden was a necessary step in mining Sacramento Hill by open-pit operations. Even more important, perhaps, in its possible implications is the attempt being made at the Ohio Copper property in Utah to leach copper rock in the stopes where it had been partly broken and partly caved some years ago but had not been removed because of its low grade. Similar experiments are now being projected elsewhere.

At some future time these events may be regarded as comparable in importance with the early nonselective mining of low-grade ore, culminating in the operations at Boleo, Lower California, which presaged the cheap mining now done at the "porphyry coppers" and with the early use of oil in the Elmore and other processes, from which has come the cheap milling now accomplished by flotation.

IMPROVEMENTS THAT HAVE MADE SELECTIVE MINING POSSIBLE

The center of the copper picture is a mosaic of remarkable technologic developments making possible modern nonselective mining with economic consequences of the highest importance. The emphasis often laid upon the effect of single factors and upon individual inventions contributing to these developments is unwarranted. Modern nonselective mining is the result of a long course of events; it represents a rising tide of results achieved through the ingenuity and the inventive contributions of thousands of men.

MINING

Until late in the last century the test of a miner's ability was his skill in selecting good ore and faithfully conserving it from breast to top turn sheets. In every mining crew the few who were best able to do this constituted a precious nucleus of men, prized as instructors, who taught the most important essential of the miner's trade to new recruits.

It is not easy to realize now that highly intensive selection in mining was still necessary at that time, though the selection practiced was less strict than that which must have prevailed through the centuries that elapsed between the inception of mining and the invention of

gunpowder. In ancient times the labor required to break ground was so great that of itself it forbade any mining of waste or of low-grade ore except when imperatively necessary. Later the use of black powder and hand drills of good steel probably had a revolutionary effect in diminishing the intensity of selection required for judicious mining. The high degree of selection still practiced several hundred years after the introduction of gunpowder and steel drills suggests the greater care that must have been necessary before their employment.

Finally the development of air drills and dynamite provided small crews of American miners with a productive energy far greater than that a Roman proconsul could command in the mines of Iberia through the labor of a myriad of slaves. The cost of breaking a given tonnage of rock, when measured in terms of over-all man power, including that used in the manufacture of drills and dynamite, was reduced accordingly. These new servants of the miner converted mineralized rock that had been too low grade for profitable mining into ores that could be mined without loss, or even at a profit. Likewise they diminished the magnitude of the loss that results from breaking material too low in grade to pay the cost of mining. Their use made the intensive selection of ore more difficult, but this disadvantage was more than paid for by other advantages attributable to their employment.

At first the advantages were most evident in the saving of time, especially in the driving of long tunnels or crosscuts. Long after air drills and dynamite had been used in opening up drifts beneath ore many mine superintendents would not permit their use in stopes, or else employed them with much caution as aids to hand mining. The advantage of being enabled to employ men less skilled in saving ore was next in importance, for the continued expansion of mining made the finding of skillful miners more and more difficult.

Nevertheless, the nonselective mining of to-day would be impossible had not its development been steadily paralleled by equally important developments in milling and smelting which have helped to render careful selection in the mine less imperative. Although neither milling nor smelting can nullify the loss occasioned by unnecessary breaking of barren rock, they furnish a means by which good ore may be conserved ultimately, when it becomes diluted with barren or low-grade material in the course of mining.

MILLING

The milling of copper ore long had as its chief object a reduction in the cost of transportation. For many mines the wagon haul to a railroad was long, difficult, dangerous, and costly; moreover, the toll for wagon haulage was but a precursor of that taken by the railroad for final transportation to a smelter. Thus the direct cost of milling, plus that of tailings losses at the mill, was weighed against the cost of transportation by wagon and rail. Many mines remote from smelters found milling profitable when recoveries were as low as 60 per cent.

Stamps were at first the usual means of crushing the ore; jigs were the only concentration devices used in many mills. Subsequently, various forms of buddles, vanners, and other devices were added to

increase the recovery of fines. It is of record that in 1876 one of the most up-to-date mills, that of the Consolidated Virginia on the Comstock Lode, made an average recovery of 73 per cent; an increase to 80 per cent in 1881 was acclaimed as a distinguished performance. In fact, it was not until the appearance and rapid adoption of tables of the Wilfley type that milling can really be said to have freed mining of the duty of selection. With the advent of tables, mine managers, although they still broke most of their high-grade ore selectively, became less fearful of losing some of it in the mill rock, for they knew much that was lost there would be ultimately recovered.

As they recognized the importance of better milling in the simplification of the mining problem, mine managers made every effort to increase the efficiency of concentration. The number of milling devices multiplied rapidly, and mills became more and more crowded with machines specialized for particular phases of recovery. Thus, it gradually came about that in the mining of veins less and less selection was practiced for some years before nonselective mining of the "porphyry coppers" was undertaken. No mere practice of skill in selective mining could possibly have rendered those huge bodies of disseminated mineral available as ore; their physical characteristics required mining en masse. But at the beginning of this century the combination of nonselective mining and milling by concentration had already become highly efficient. Low-grade ore in veins was occasionally mined nonselectively and milled without loss, even though its grade was comparable with that of "the porphyries." An attempt to mine the latter had therefore become logical if not inevitable.

Almost complete abandonment of selection in mining was the ultimate phase of the drift from old conceptions, sound in themselves and still essentially true. A broader outlook now governs the application of these conceptions; mining, milling, and smelting are regarded as organic parts of a unified operation whose purpose is the production of metal at minimum overall cost. For the exercise of human skill in the selection of ore at the face there has been substituted selection by mechanical and metallurgical processes in mills and smelters.

Recognition of this fact explains why intelligent men once referred to mining methods as fixed and inflexible because of natural conditions; indeed, there is slight latitude in the choice of these methods if intensive selection must be accomplished in the mine. It is not at all strange that practical men, whose training and experience had emphasized the imperative necessity for such selection, were unable to foresee the astounding improvements in technology which in a few recent years have greatly surpassed all previous advances in the art of winning metal from the earth's crust and rendering it available for use.

Flotation.—One of the later developments in milling by concentration was that of fine grinding by tube mills and other devices in order to free small particles of valuable minerals from table middlings and from ore in which the valuable minerals were minutely disseminated. This development prepared the way for the appearance of flotation.

Throughout the history of concentration the recovery of slimes had always been a perplexing problem. The crushing of brittle minerals inevitably produces some impalpable dust; the recovery of this from the water used in milling was always difficult and to some extent impossible. Fine particles of some sulphide minerals have a tendency to rise and float away on the surface of water, or to remain suspended until given a great deal of time for quiet settling. Accordingly, much effort had been spent in devising means for breaking ore with a minimum of dusting. Then came the discovery that slimes of sulphide minerals could be floated in a froth and easily recovered through the agency of small quantities of oil introduced into the mill water. At that time many concentrating mills were so efficient that their managers at first regarded flotation as applicable only to the recovery of slimes. Now, however, most mills treating copper sulphides have been remodeled, and concentration is replaced by flotation.

Flotation is so efficient that it suggests the ultimate of possible attainment in the milling of such ore; the recoveries now obtained often leave so little in the tailings that their value is almost negligible. In consequence, the mining of the sulphide ores of copper has made prodigious advances in the utilization of natural forces it was formerly compelled to oppose. The most striking example of this is found in such mines as those at Ray and Miami, where enormous blocks of ore are undermined until they cave down to chutes from which the rock, shattered by its own movement, is withdrawn for milling. Here the whole mass of ore is the unit of selection, and entire reliance for the ultimate recovery of the minerals contained is placed upon milling. The result is a lowering of mining costs to a figure which seems as near the ultimate of possible attainment as those for the recovery of metal at some mills using flotation.

The fact should not be overlooked, however, that these are exceptionally effective applications of the knowledge gradually acquired in vein mining. Some degree of selection is still necessary in the greater part of copper mining, but in a larger way; discretion in this respect now rests more generally with the mine foreman or superintendent than with the individual miner. Someone, however, having due regard to individual factors applying to the recovery of each orebody, must determine the degree and character of selection advisable. A recent interesting example of an important result accomplished by selection is reported from Butte, where the grade of ore sent to the mills was raised about one-third by adoption of rough hand sorting underground for rejection of large chunks of obvious waste.

SMELTING

The notable advances in mining and milling have been paralleled by those in smelting; but smelting has not been as closely identified with recent phases of development of nonselective mining as has milling, although the beginning of that development was initiated through the aid of smelting. At an earlier time, before milling had attained a high degree of efficiency, smelting functioned much as milling does now—as a means of recovering minerals diluted by admixture of low-grade material in the course of mining. Its application was restricted, however, to comparatively high-grade ore, of which a

considerable amount was then available. Still later there was a remarkable application of smelting to the ores of the Boundary district of British Columbia, where low-grade deposits of disseminated chalcopyrite, similar to some of the porphyry coppers, were mined and smelted directly without previous milling. This Boundary district ore averaged throughout 1 to 1.5 per cent copper and returned a fairly substantial profit. Had duplication of that performance elsewhere been generally possible the importance of milling would have been somewhat diminished; but it appears that the Boundary ores were nearly, and sometimes quite, self-fluxing.

The mines of Butte, served by great copper smelters at their very gates, undoubtedly enjoyed many opportunities to diminish the intensity of selective mining and profited accordingly. Butte mines were favored as well by the high grade of their ore, which made over-all recovery by means of smelting especially applicable. Such good fortune was unusual, however, as the benefits of smelting can be realized by widely scattered mines only by adding to their costs the toll of expensive railroad haulage.

At a time when a long succession of technologic triumphs in the development of copper blast furnace practice had culminated in the building of furnaces more than 80 feet long at Anaconda further advances in this phase of smelting began to decline in importance because of the rapid increase in the quantity of concentrates which required roasting followed by smelting in reverberatory furnaces. The monster blast furnace at Anaconda has now been idle for several years, and elsewhere the blast furnace, if found at all, serves generally as an adjunct of more extensive smelting in reverberatories.

SOME FACTORS THAT WILL INFLUENCE THE FUTURE OF THE INDUSTRY

Among the factors that affect the future of the copper industry the rôle of the African mines is important, though its evaluation is difficult. Of Katanga as a source of copper there are two extreme opinions—the one holding that the output is in the nature of a rising flood that menaces the present stability of the copper industry and may disrupt the world market for copper; the other, that Katanga may fairly be ignored because an inadequate supply of labor, the high cost of transportation, and the long time required for the development of industry in a wilderness all tend to nullify for the present and near future the important advantage of high-grade ore in huge deposits close to the surface.

It is probable that neither of these extreme views deserves the consideration it has received but that those who hold a middle ground between them are nearer right. It should be recognized frankly that Katanga and northern Rhodesia enjoy a fortunate inheritance in the highly developed copper technology of America, which will enable them to reduce costs steadily toward the low average prevailing here, while the high grade of their ores will tend to compensate for disadvantages of location. They should be able to practice such selection as may be necessary to render production profitable. At the same time, the well-equipped and finely organized American mines will have, relatively, a far more limited range in which to effect further improvement. It is difficult to see, for

example, how the costs of Ray or Miami can be much cheapened, though the latter has recently recorded another triumph following the exhaustion of its available "high-grade" ore—that containing more than 1 per cent copper. So much may be said in the support of the view that Katanga constitutes a serious menace to American copper.

On the other hand, it will be recalled that the proposed development of the porphyries gave rise to a somewhat similar idea and was viewed with alarm by many who believed the consumption of copper could not possibly expand at a rate commensurate with the anticipated production. Undoubtedly the increased production due to the porphyries was responsible for some embarrassment. Some marginal mines were closed, and at the established mines the amount of actual profit earned was decreased below that they might have received had the production of copper been less ample; but, on the whole, the more pessimistic forecasts were not fulfilled. In the long run consumption has nearly kept pace with production, there has been no great or lasting disruption of the copper industry, and, taken by and large, the industry has prospered fairly well, as attested by the record of dividends paid.

The development of African copper, following a technologic course well charted by America, may be expected to be swift, but swift only as such things go; at best progress requires much time, and there will be many economic forces tending to hold the increase of production in reasonable relation to consumption. It is not easy to plot accurately in advance the course of economic adjustments that will inevitably occur; but the history of the industry unmistakably forecasts that consumption will continue to increase, yet will be fairly commensurate with the probable output in the near future. This merely paraphrases an interesting comment of Horace Stevens in the Copper Handbook of 1900, wherein he referred to pessimistic opinions on the outlook for copper that were based on the rapid increase in output at the time. Finding that statistics generally showed that consumption increased from 50 to 60 per cent each decade, he made two tables indicating the prospective increases at those rates. The results seemed so astounding that they were offered with some apology, rather as suggesting a tendency than as offering a prediction. Nevertheless the table, based on a 60 per cent increase, indicated for 1930 a production which already has been substantially attained.

Although indefinitely extending beyond a certain point such a production curve as that exhibited by copper gives merely a mathematical curiosity; assuredly no factor is evident as yet which should tend to check seriously the steady growth of copper consumption which has continued for so many years. In general, commodity prices are about 50 per cent above the pre-war level, but copper now sells at less than its pre-war price. Obviously it is now very cheap, indeed, with respect to the high value of its properties as a metal. Future consumption should readily absorb a considerably larger output, provided the competitive relations with other metals remain virtually unchanged.

PRODUCTION

SMELTER PRODUCTION

The copper output of the United States smelters in 1925 from domestic ores exceeded the peace-time record output of 1924 by 40,620,694 pounds. Three smelters that were busy during a part of 1924 were idle during the entire year of 1925—the smelters of The Old Dominion Co. at Globe, Ariz.; the Southwest Metals Co., at Humboldt, Ariz.; and the East Butte Copper Mining Co., at Butte, Mont. The smelter of the United States Smelting, Refining & Mining Co. ran only until September 1, 1925. The smelter and other properties of the Ducktown Sulphur, Copper & Iron Co. were sold during the year to the Ducktown Chemical & Iron Co., an American company.

The domestic smelter output from ores of domestic origin represented 56 per cent of the world's copper production in 1913, 61 per cent in 1918, 57 per cent in 1920, 41 per cent in 1921, 51 per cent in 1922, 53 per cent in 1923, and 55 per cent in 1924 and 1925.

Copper produced (smelter output) in the United States, 1845–1925

[Values rounded]

Year	Quantity	Increase	Value	Year	Quantity	Increase	Value
	Pounds	*Pounds*			*Pounds*	*Pounds*	
1845	224,000		$45,000	1887	181,477,331	23,714,288	$25,044,000
1846	336,000	112,000	57,000	1888	226,361,466	45,440,942	38,029,000
1847	672,000	336,000	124,000	1889	226,775,962	414,496	30,615,000
1848	1,120,000	448,000	218,000	1890	259,763,092	32,987,130	40,523,000
1849	1,568,000	448,000	349,000	1891	284,121,764	24,358,672	36,368,000
1850	1,456,000	[1] 112,000	320,000	1892	344,998,679	60,876,915	40,020,000
1851	2,016,000	560,000	334,000	1893	329,354,398	[1] 15,644,281	35,570,000
1852	2,464,000	448,000	542,000	1894	354,188,374	24,833,976	33,648,000
1853	4,480,000	2,016,000	985,000	1895	380,613,404	26,425,030	40,726,000
1854	5,040,000	560,000	1,108,000	1896	460,061,430	79,448,026	49,687,000
1855	6,720,000	1,680,000	1,814,000	1897	494,078,274	34,016,844	59,289,000
1856	8,960,000	2,240,000	2,419,000	1898	526,512,987	32,434,713	65,288,000
1857	10,752,000	1,792,000	2,688,000	1899	568,666,921	42,153,934	97,242,000
1858	12,320,000	1,568,000	2,833,000	1900	606,117,166	37,450,245	100,615,000
1859	14,112,000	1,792,000	3,104,000	1901	602,072,519	[1] 4,044,647	100,546,000
1860	16,128,000	2,016,000	3,709,000	1902	659,508,644	57,436,125	80,460,000
1861	16,800,000	672,000	3,696,000	1903	698,044,517	38,535,873	95,632,000
1862	21,160,000	4,360,000	4,655,000	1904	812,537,267	114,492,750	104,005,000
1863	19,040,000	[1] 2,120,000	6,473,000	1905	888,784,267	76,247,000	138,650,000
1864	17,920,000	[1] 1,120,000	8,422,000	1906	917,805,682	29,021,415	177,136,000
1865	19,040,000	1,120,000	7,473,000	1907	868,996,491	[1] 48,809,191	173,799,000
1866	19,936,000	896,000	6,828,000	1908	942,570,721	73,574,230	124,419,000
1867	22,400,000	2,464,000	5,682,000	1909	1,092,951,624	150,380,903	142,084,000
1868	25,984,000	3,584,000	5,976,000	1910	1,080,159,509	[1] 12,792,115	137,180,000
1869	28,000,000	2,016,000	6,790,000	1911	1,097,232,749	17,073,240	137,154,000
1870	28,224,000	224,000	5,977,000	1912	1,243,268,720	146,035,971	205,139,000
1871	29,120,000	896,000	7,023,000	1913	1,224,484,098	[1] 18,784,622	189,795,000
1872	28,000,000	[1] 1,120,000	9,956,000	1914	1,150,137,192	[1] 74,346,906	152,968,000
1873	34,720,000	6,720,000	9,721,000	1915	1,388,009,527	237,872,335	242,902,000
1874	39,200,000	4,480,000	8,624,000	1916	1,927,850,548	539,841,021	474,288,000
1875	40,320,000	1,120,000	9,152,000	1917	1,886,120,721	[1] 41,729,827	514,911,000
1876	42,560,000	2,240,000	8,937,000	1918	1,908,533,595	22,412,874	471,408,000
1877	47,040,000	4,480,000	8,937,000	1919	1,286,419,329	[1] 622,114,266	239,274,000
1878	48,160,000	1,120,000	7,994,000	1920	1,209,061,040	[1] 77,358,289	222,467,000
1879	51,520,000	3,360,000	9,582,000	1921	505,586,098	[1] 703,474,942	65,221,000
1880	60,480,000	8,960,000	12,943,000	1922	950,285,947	444,699,849	128,289,000
1881	71,680,000	11,200,000	13,046,000	1923	1,434,999,962	484,714,015	210,945,000
1882	90,646,232	18,966,232	17,313,000	1924	1,634,249,192	199,249,230	214,087,000
1883	115,526,053	24,879,821	19,062,000	1925	1,674,869,886	40,620,694	237,832,000
1884	144,946,653	29,420,600	18,843,000				
1885	165,875,483	20,928,830	17,915,000		35,802,060,557		5,952,436,000
1886	157,763,043	[1] 8,112,440	17,512,000				

[1] Decrease.

The figures of smelter production in 1925 are based on confidenti returns from all known smelting companies handling copper-bearir materials from the United States. Sincere thanks are extended t all companies and officials who have aided in furnishing this inform tion and have given valuable time to answering inquiries concernin distribution of the output. The following list gives the names o the owning or operating companies, the location, and the final coppe product of smelting and refining plants treating material from th United States during 1925. It does not include lead and zinc plant that recovered copper as a by-product from mixed ores. Lists o lead and zinc smelters can be found in the chapters on those metal

Copper reduction plants that treated materials from the United States in 1925 [1]

Location	Company	Final copper product
Arizona:		
Ajo	New Cornelia Copper Co	Electrolytic.
Clarkdale	United Verde Copper Co	Blister.
Do	United Verde Extension Mining Co	Do.
Douglas	Calumet & Arizona Mining Co	Do.
Do	Phelps Dodge Corporation	Do.
Hayden	American Smelting & Refining Co	Do.
Miami	International Smelting Co	Do.
Clifton	Phelps Dodge Corporation	Do.
Superior	Magma Copper Co	Do.
California:		
Copperopolis	Calaveras Copper Co	Do.
Kennett	United States Smelting, Refining & Mining Co	Do.
Maryland: Baltimore	Baltimore Copper Smelting & Rolling Co	Electrolytic.
Michigan:		
Hancock	Quincy Mining Co	Anodes and lake.
Houghton	Michigan Smelting Co	Do.
Hubbell	Calumet & Hecla Mining Co	Do.
Montana:		
Anaconda	Anaconda Copper Mining Co	Blister.
Great Falls	do	Electrolytic.
Nevada: McGill	Nevada Consolidated Copper Co	Blister.
New Jersey:		
Chrome	United States Metals Refining Co	Blister, electrolytic, an casting.
Maurer	American Smelting & Refining Co	Do.
Newark	Balbach Smelting & Refining Co	Casting.
Perth Amboy	Raritan Copper Works	Electrolytic.
New York: Laurel Hill	Nichols Copper Co	Blister and electrolytic.
Tennessee:		
Copperhill	Tennessee Copper Co	Blister.
Isabella	Ducktown Chemical & Iron Co	Do.
Texas: El Paso	American Smelting & Refining Co	Do.
Utah:		
Garfield	Garfield Smelting Co	Do.
International	International Smelting Co	Do.
Virginia: West Norfolk	Norfolk Smelting Co	Do.
Washington: Tacoma	American Smelting & Refining Co	Blister and electrolytic.

[1] This list does not include a smelter in Pennsylvania, which made blister from material solely of foreig origin.

During the year the copper smelting and refining plants shown above treated material from the United States; all of these were domestic plants. The figures of production represent the actual smelter recovery. For Michigan it is the sum of furnace-refined copper and copper cast into anodes for electrolytic refining. As to blister copper, the figures represent the fine copper content. Some casting and electrolytic copper is produced direct from ore or matte, and this is included in the smelter production. Metallic and cement copper recovered by leaching is also included in smelter production.

MINE PRODUCTION

The figures of mine production are based on reports furnished to the Bureau of Mines by all mines producing copper. The mines and smelters of several of the large copper producers are under the same management, and their production is reported on the same basis. The figures furnished by mines that ship to custom smelters or have only matting furnaces and ship their matte for conversion are likely to differ considerably from the smelter returns, as the mines may report a considerable quantity that has not reached the stage of blister copper by the end of the year and is consequently not included in the smelter production, or material that was reported by the mines in one year may be treated by the smelters in the following year. This discrepancy is more pronounced if a marked curtailment of production occurs at the beginning or the end of the year, so that there is not the balance of overlap that occurs if the industry is in normal condition throughout the year. Considerable copper is recovered by the smelters from ores that are treated primarily for other metals, the copper content being so low that it is not paid for and consequently is not always reported by the mines. The difference between the smelter and the refinery production is accounted for entirely by an increase in the stocks of blister copper plus the copper content of bluestone produced and the loss in refining.

Detailed figures on ore production in 1924 which were not available when the 1924 report on copper was prepared are included in this report, and the 1926 report will contain detailed ore figures for 1925.

Copper produced from domestic ores as reported by mines, smelters, and refineries, 1918–1925, in pounds

Year	Mine	Smelter	Refinery
1918	1,910,022,841	1,908,533,595	1,882,874,191
1919	1,212,334,041	1,286,419,329	1,433,485,795
1920	1,224,550,151	1,209,061,040	1,182,423,240
1921	466,190,853	505,586,098	609,414,256
1922	904,583,894	950,285,947	904,670,685
1923	1,477,739,709	1,434,999,962	1,464,164,995
1924	1,606,165,018	1,634,249,192	1,674,214,599
1925	1,678,117,747	1,674,869,886	1,682,895,347

PRODUCTION BY STATES

The mine and smelter production figures, by States, for 1924 and 1925 are shown in the table below; in the second table following the smelter production from 1845 through 1925, by States, is shown. Arizona, Montana, Utah, and Michigan lead in production for 1925 with 82 per cent of the smelter output. If the production of Nevada, New Mexico, and Alaska is added to the output of the States already mentioned, 96 per cent of the output of the country is represented. In total production from 1845 through 1925 Arizona, Montana, and Michigan are especially impressive, having made 30.56, 25.06, and 10.96 per cent, respectively, of the country's total output. Utah stands fourth with 8.93 per cent, and the four States together have produced 86 per cent of the total. If the production of Nevada, New Mexico, and Alaska is added to that of the above States, 94 per cent of the country's output is represented.

Copper produced in the United States, 1924–25, according to smelter and mine returns, by States, in pounds

State	1924		1925			
	Smelter returns	Mine returns	Rank	Smelter returns		Mine returns
				Percentage of total	Quantity	
Alaska	77,053,492	74,074,207	7	4.31	72,204,166	73,855,298
Arizona	672,365,115	677,752,013	1	43.15	722,653,457	713,355,129
California	49,433,716	52,107,171	8	2.80	46,943,604	46,864,913
Colorado	4,158,612	2,713,219	10	.19	3,163,211	2,360,500
Idaho	3,148,519	2,738,824	11	.19	3,144,064	3,297,443
Michigan	145,333,227	135,662,605	4	8.24	138,029,764	155,157,488
Missouri	184,947	182,811	15	-------	12,114	12,100
Montana	249,322,394	249,152,062	2	16.16	270,604,676	268,910,847
Nevada	77,281,479	73,805,323	5	4.60	77,137,563	79,300,224
New Mexico	78,145,629	74,691,436	6	4.57	76,467,245	76,427,825
Oregon	716,656	768,395	14	.01	126,107	106,325
Pennsylvania	1,263,535	1,114,694	13	.03	562,240	1,035,824
South Dakota	4,199	-------	16	-------	2,336	-------
Tennessee	18,251,996	18,335,635	9	1.18	19,789,234	19,788,234
Texas	302	-------	17	-------	785	-------
Utah	256,531,349	242,138,165	3	14.49	242,730,986	236,486,540
Washington	978,647	928,458	12	.07	1,184,807	1,159,057
Wyoming	-------	-------	18	-------	331	-------
Undistributed	75,378	-------	-------	.01	113,196	-------
	1,634,249,192	1,606,165,018	-------	100.00	1,674,869,886	1,678,117,747

Copper produced in the United States, 1845–1925, by States

[Smelter output]

State	Pounds	Percentage	Rank
Alaska	953,064,189	2.66	7
Arizona	10,939,638,700	30.56	1
California	940,045,638	2.63	8
Colorado	305,906,343	.85	10
Idaho	127,912,221	.36	11
Michigan	7,504,977,527	20.96	3
Montana	8,971,016,719	25.06	2
Nevada	1,195,822,015	3.34	5
New Mexico	957,464,769	2.67	6
Oregon	18,501,048	.05	14
Tennessee	[1] 469,542,000	1.31	9
Utah	3,197,609,150	8.93	4
Washington	21,066,911	.06	13
Wyoming	31,673,137	.09	12
Other States and unapportioned	167,820,190	.47	-------
	35,802,060,557	100.00	-------

[1] Approximate production.

Mine production of copper in the principal districts, 1924–25

[Districts that produced over 1,000,000 pounds]

District or region	State	1924		1925	
		Mine output (pounds)	Percentage of total production	Mine output (pounds)	Percentage of total production
Butte	Montana	247,364,000	15.40	266,637,000	15.89
Bingham	Utah	236,181,000	14.70	227,612,000	13.56
Globe-Miami	Arizona	190,452,000	11.86	175,272,000	10.44
Lake Superior	Michigan	135,663,000	8.45	155,157,000	9.25
Yavapai County (mostly Jerome district).	Arizona	143,348,000	8.92	154,017,000	9.18
Bisbee (Warren)	do	140,630,000	8.76	145,433,000	8.67
Ely (Robinson)	Nevada	73,279,000	4.56	78,627,000	4.69
Ray (Mineral Creek)	Arizona	67,854,000	4.22	74,695,000	4.45
Ajo	do	63,884,000	3.98	69,262,000	4.13
Central (including Santa Rita)	New Mexico	66,824,000	4.16	68,812,000	4.10
Copper River	Alaska	[1] 59,647,000	3.71	(2)	(2)
Morenci-Metcalf	Arizona	41,047,000	2.56	59,464,000	3.54
Pioneer	do	[3] 23,302,000	1.45	[3] 27,021,000	1.61
Plumas County	California	25,558,000	1.59	26,918,000	1.60
Ducktown	Tennessee	18,336,000	1.14	19,788,000	1.18
Shasta County	California	21,056,000	1.31	14,551,000	.87
Prince William Sound	Alaska	[3] 14,250,000	.89	(2)	(2)
Lordsburg	New Mexico	4,928,000	.31	5,064,000	.30
Foothill belt	California	4,855,000	.30	4,893 000	.29
Tintic	Utah	3,076,000	.19	4,627,000	.28
Silver Bell	Arizona	1,444,000	.09	3,048,000	.18
Park City	Utah	2,085,000	.13	2,466,000	.15
Pima	Arizona	1,907,000	.12	2,408,000	.14
Alder Creek	Idaho	1,141,000	.07	2,356,000	.14
Burro Mountain	New Mexico	2,655,000	.17	1,891,000	.11
San Juan County	Colorado	1,602,000	.10	1,502,000	.09
Montana	Montana	1,187,000	.07	1,290,000	.08
Index	Washington	[4]		1,087,000	.06
Lebanon (Cornwall mine)	Pennsylvania	1,115,000	.07	1,036,000	.06
Courtland (Turquoise)	Arizona	1,330,000	.08	[4]	

[1] According to U. S. Geological Survey.
[2] Geological Survey not at liberty to publish figures.
[3] As shown in company's annual report to stockholders.
[4] Less than 1,000,000 pounds.

Copper produced in the principal districts to the end of 1925

District	State	Date production began	Pounds	Per cent	Rank
Butte	Montana	1868	8,917,426,000	24.91	1
Lake Superior	Michigan	1845	7,483,009,000	20.90	2
Bisbee	Arizona	1880	3,315,157,000	9.26	3
Bingham	Utah	1896	2,836,683,000	7.92	4
Globe-Miami	Arizona	1881	2,432,490,000	6.79	5
Jerome	do	1883	[1]	[1]	6
Morenci-Metcalf	do	1873	1,657,518,000	4.63	7
Ely (Robinson)	Nevada	1908	1,067,115,000	2.98	8
Central (including Santa Rita)	New Mexico	1800	845,202,000	2.36	9
Ray (Mineral Creek)	Arizona	1911	817,342,000	2.28	10
Shasta County	California	1897	614,738,000	1.72	11
Ducktown	Tennessee	1850	469,640,000	1.31	12
Tintic	Utah	1880	167,380,000	.47	13
Foothill belt	California	1862	166,392,000	.46	14

[1] Bureau of Mines not at liberty to publish figures for Jerome district separately in 1924 and 1925. The total through 1923 was 1,556,324,000 pounds.

QUANTITY AND ESTIMATED RECOVERABLE CONTENT OF COPPER-BEARING ORES

For many years the general report on copper in Mineral Resources has contained a section on mine production of copper, including tables showing copper ore produced, copper ore concentrated, smelted, leached, etc. This copper chapter for 1925 is published with detailed ore figures for 1924, and the 1925 ore figures will be published in the chapter for 1926.

The following tables show the quantity and the estimated recoverable copper content of the ore produced by the mines of the United States in 1921 to 1924. The figures are taken from the mine reports in Mineral Resources. The close agreement between the output as reported by the smelters and the recoverable quantity as reported by the mines indicates that the estimated recoverable tenor is very close to the actual recovery. The classification of some of the complex western ores is difficult and more or less arbitrary. Under copper ores are classed not only those which contain 2.5 per cent or more of copper but those which contain less than this percentage if they are valuable chiefly for copper. Under copper-lead and copper-zinc ores are classed complex ores in which copper is a valuable constituent. Mines report considerable copper from ores mined primarily for other metals. These include siliceous gold and silver ores, lead ores, zinc ores, pyritic sulphur ores, and ores concentrated for their content of other metals. No attempt has been made to compile tables showing the quantity and recoverable content of this group of copper-bearing ores, but with old slags and other materials they yielded a total of 36,934,401 pounds of copper in 1924.

Copper produced in the United States in 1924 from ores in which copper constitutes the principal value

State	Copper ore (short tons)	Copper produced		Gold produced (fine ounces)	Silver produced (fine ounces)	Value of gold and silver per ton of ore
		Pounds	Percentage			
Alaska	761,779	74,071,273	4.86	645.37	572,078	$0.52
Arizona	[1] 19,460,836	[2] 675,066,967	1.73	128,121.07	5,101,837	.31
California	823,739	50,175,248	3.05	21,064.75	871,166	1.24
Colorado	1,803	119,315	3.31	2,136.19	24,666	33.66
Idaho	37,634	1,989,050	2.64	2,407.47	504,644	10.31
Michigan	5,372,572	135,662,605	1.26		130,381	[3] .61
Montana	3,278,662	[4] 238,852,990	3.49	24,384.02	7,518,428	1.69
Nevada	3,505,301	[5] 73,004,373	1.04	32,314.93	106,614	.21
New Mexico	2,832,901	74,494,746	1.31	12,625.60	131,743	.12
Oregon	14,831	764,709	2.58	2,001.75	12,694	3.36
Tennessee	714,975	18,335,635	1.28	328.95	94,779	.10
Utah	12,357,366	[6] 223,285,907	.90	83,444.56	887,541	.19
Washington	15,916	927,407	2.91	117.70	44,173	2.01
Total and average	49,178,315	1,566,750,225	1.59	309,592.36	16,000,744	.35

[1] Includes 1,100 tons of slag and 1,195,036 tons of ore leached.
[2] Includes copper from 1,100 tons of slag and excludes 571,861 pounds of copper from mine water precipitates.
[3] Calculated only on ore that yielded silver.
[4] Excludes 4,215,942 pounds of copper from precipitates, but includes copper from 141,907 tons of tailings.
[5] Excludes 212,654 pounds of copper leached from ore "in place" and 108,309 pounds from mine water precipitates.
[6] Excludes 11,668,436 pounds of copper recovered as precipitates from mine waters.

Copper produced in the United States, 1921–1923, from ores in which copper constitutes the principal value

State	1921		1922		1923	
	Copper ore (short tons)	Copper produced (pounds)	Copper ore (short tons)	Copper produced (pounds)	Copper ore (short tons)	Copper produced (pounds)
Alaska	476,967	56,974,887	581,384	77,967,469	731,168	85,915,589
Arizona	5,181,177	184,812,780	10,431,729	[1] 399,014,848	16,331,974	[2] 612,160,974
California	396,134	11,599,540	447,200	21,845,111	546,404	26,725,749
Colorado	22,195	1,164,248	863	105,864	4,655	302,635
Idaho	10,322	1,105,511	32,590	2,572,335	41,901	2,794,091
Michigan	3,610,648	86,370,028	4,952,264	121,712,365	5,363,160	138,304,080
Montana	928,461	46,888,812	3,250,213	[1] 152,823,229	4,392,291	[2] 213,554,072
Nevada	401,153	10,318,851	629,408	[1] 22,452,852	2,833,908	66,089,635
New Mexico	533,231	13,637,034	1,477,166	31,669,547	2,946,800	61,179,811
North Carolina					157	61,983
Oregon	2,398	174,300	17,117	1,012,189	18,940	1,261,954
Tennessee	564,457	15,084,294	557,750	14,240,571	776,477	18,721,932
Texas			73	4,290	48	3,080
Utah	1,357,857	27,321,481	4,509,380	[1] 90,523,462	11,519,722	[2] 209,575,614
Washington	1,332	246,017	6,086	312,912	11,128	855,152
Wyoming	50	10,000	24	4,296	584	111,280
	13,396,382	455,797,733	26,893,247	936,261,340	45,519,317	1,437,626,681

[1] Exclusive of copper recovered as precipitates from mine waters, as follows: Arizona, 249,343 pounds; Montana, 10,037,514 pounds; Nevada, 187,190 pounds; Utah, 563,718 pounds.
[2] Exclusive of copper recovered as precipitates from mine waters, as follows: Arizona, 133,055 pounds; Montana, 5,781,839 pounds; and Utah, 4,726,339 pounds.

Copper ores concentrated, smelted, and leached, and copper produced from each class of ore in the United States in 1924

State	Ore concentrated			
	Short tons	Concentrates produced (short tons)	Copper produced (pounds)	Percentage of copper from ore
Alaska	737,646	73,085	49,427,639	3.35
Arizona	15,707,477	1,061,484	373,727,904	1.19
California	619,440	62,741	30,183,107	2.44
Idaho	27,395	3,391	882,154	1.61
Michigan	5,372,572	[1] 106,890	[2] 135,662,605	1.26
Montana	3,157,349	[3] 1,361,681	[4] 228,792,355	3.47
Nevada	3,418,900	371,000	65,540,946	.96
New Mexico	[5] 2,706,200	143,108	[5] 66,776,506	1.23
Oregon	14,746	3,418	757,442	2.57
Tennessee	304,739	34,698	7,095,048	1.16
Utah	12,345,452	641,389	221,264,006	.90
Washington	15,348	1,465	807,221	2.63
Total and average	44,427,264	3,864,350	1,180,916,933	1.33

State	Ore leached			Ore smelted		
	Short tons	Copper produced (pounds)	Percentage of copper	Short tons	Copper produced (pounds)	Percentage of copper
Alaska				24,133	24,643,634	51.06
Arizona	1,195,036	24,476,361	1.02	2,557,223	276,520,029	5.41
California				204,299	19,992,141	4.89
Colorado				1,803	119,315	3.31
Idaho				10,239	1,106,896	5.41
Montana				121,313	10,060,635	4.15
Nevada				86,401	7,463,427	4.32
New Mexico	(5)	(5)	(5)	126,701	7,718,240	3.05
Oregon				85	7,267	4.27
Tennessee				410,236	11,240,587	1.37
Utah				11,914	2,021,901	8.49
Washington				568	120,186	10.58
Total and average	1,195,036	24,476,361	1.02	3,554,915	361,014,258	5.08

[1] Includes concentrates from sands.
[2] Includes copper from sands.
[3] Includes concentrates from 141,907 tons of tailings treated.
[4] Includes copper from 141,907 tons of tailings treated.
[5] A quantity of copper from New Mexico was leached, but this may not be shown separately and is included under ore concentrated.

Copper ores concentrated and smelted, and copper produced from each class of ore in the United States, 1921–1923

State	Ore concentrated					
	1921		1922		1923	
	Short tons	Copper produced (pounds)	Short tons	Copper produced (pounds)	Short tons	Copper produced (pounds)
Alaska	448,236	34,585,960	544,212	48,423,640	686,532	49,933,280
Arizona	3,632,342	94,634,203	7,617,726	202,095,491	11,997,060	299,547,445
California	306,024	11,580,827	431,601	19,890,598	516,117	22,550,703
Idaho	300	8,686	15,776	708,291	25,813	1,257,580
Michigan	3,610,648	[1] 86,370,028	4,952,264	[1] 121,712,365	5,363,160	[1] 138,304,080
Montana	881,051	40,447,426	3,132,253	142,465,556	4,259,075	203,004,810
Nevada	392,645	8,824,837	518,523	9,745,733	2,722,054	54,943,730
New Mexico	533,165	13,633,402	1,416,869	28,406,314	[2] 2,834,564	[2] 55,350,789
Oregon	2,398	174,300	15,070	813,869	17,980	1,176,143
Tennessee	102,517	2,801,200	138,440	2,803,994	276,465	6,070,443
Utah	1,113,218	23,813,053	4,471,711	88,098,018	11,500,803	208,370,507
Washington			4,525	78,284	10,131	674,312
	11,022,544	316,873,922	23,258,970	665,242,153	40,209,754	1,041,183,822

State	Ore smelted					
	1921		1922		1923	
	Short tons	Copper produced (pounds)	Short tons	Copper produced (pounds)	Short tons	Copper produced (pounds)
Alaska	28,731	22,388,877	37,172	29,543,829	44,636	35,982,309
Arizona	617,786	69,971,143	1,457,773	169,963,032	2,522,229	274,142,937
California	110	18,713	15,599	1,954,513	30,287	4,175,046
Colorado	22,195	1,164,248	863	105,864	4,655	302,685
Idaho	10,022	1,096,825	16,814	1,864,044	16,088	1,536,511
Montana	47,410	6,441,386	117,960	10,357,673	133,216	10,549,262
Nevada	8,508	1,494,014	110,885	12,707,119	111,704	11,111,992
New Mexico	66	3,632	60,297	3,263,233	112,236	5,829,022
North Carolina					157	61,983
Oregon			2,047	198,320	960	85,811
Tennessee	461,940	12,283,094	419,310	11,436,577	500,012	12,651,489
Texas			73	4,290	48	3,080
Utah	37,452	2,766,069	37,669	2,425,444	18,919	1,205,107
Washington	1,332	246,017	1,561	234,628	997	180,840
Wyoming	50	10,000	24	4,296	584	111,280
	1,235,602	117,884,018	2,278,047	244,062,862	3,496,728	357,929,354

[1] Includes copper from sands.
[2] A quantity of copper ore from New Mexico was leached, but this may not be shown separately and is included under ore concentrated.

Copper produced from copper-lead and copper-zinc ores in the United States in 1924

State	Copper-lead and copper-zinc ores (short tons)	Copper produced (pounds)	Percentage of copper
Alaska	29	959	1.65
Arizona	5,244	118,663	1.13
Colorado	425	41,498	4.88
Idaho	4,462	54,803	.61
Montana	209,185	2,219,010	.53
Nevada	3	489	8.15
New Mexico	507	39,713	3.92
Utah	19	5,257	13.83
Total and average	219,874	2,480,392	.56

Copper derived from ores classed as copper-bearing (copper, copper-lead, and copper-zinc ores) and total production of copper from all sources in the United States in 1924

State	Ore treated (short tons)	Copper recovered (pounds)	Percentage of copper	Copper from all sources, including old slags, smelter cleanings, and precipitates (pounds)
Alaska	761,808	74,072,232	4.86	74,074,207
Arizona	19,466,080	675,185,630	1.73	677,752,013
California	823,739	50,175,248	3.05	52,107,171
Colorado [1]	2,228	160,813	3.61	2,713,219
Idaho	42,096	2,043,853	2.43	2,738,824
Michigan	5,372,572	135,662,605	1.26	135,662,605
Missouri				182,811
Montana [2]	3,487,847	241,072,000	3.46	249,152,062
Nevada	3,505,304	73,004,862	1.04	73,805,323
New Mexico	2,833,408	74,534,459	1.32	74,691,436
Oregon	14,831	764,709	2.58	768,395
Pennsylvania				1,114,694
Tennessee	714,975	18,335,635	1.28	18,335,635
Utah [2]	12,357,385	223,291,164	.90	242,138,165
Washington	15,916	927,407	2.91	928,458
Total and average	49,398,189	1,569,230,617	1.59	1,606,165,018

[1] Most of the copper from Colorado is derived from ores classed as siliceous ores and lead ores.
[2] Considerable copper was recovered as precipitates from mine waters and from ores not classed as copper ores.

Copper derived from ores classed as copper-bearing (copper, copper-lead, and copper-zinc ores) and total production of copper from all sources in the United States, 1921–1923

State	1921			1922			1923		
	Ore treated	Copper recovered	Copper from all sources, including old slags, smelter cleanings, and precipitates	Ore treated	Copper recovered	Copper from all sources, including old slags, smelter cleanings, and precipitates	Ore treated	Copper recovered	Copper from all sources, including old slags, smelter cleanings, and precipitates
	Short tons	*Pounds*	*Pounds*	*Short tons*	*Pounds*	*Pounds*	*Short tons*	*Pounds*	*Pounds*
Alaska	476, 967	56, 974, 837	57, 011, 597	581, 384	77, 967, 469	77, 967, 819	731, 227	85, 920, 539	85, 920, 645
Arizona [1]	5, 181, 318	184, 823, 028	185, 034, 194	10, 432, 164	399, 040, 128	400, 043, 128	16, 332, 203	612, 192, 830	618, 928, 602
California	306, 134	11, 599, 540	11, 743, 404	447, 247	21, 849, 249	22, 539, 485	546, 487	26, 733, 433	28, 317, 759
Colorado [2]	23, 015	1, 242, 696	4, 153, 442	1, 490	166, 163	3, 373, 454	5, 035	326, 187	4, 248, 109
Georgia				600	6, 000	6, 000			
Idaho	19, 444	1, 231, 228	1, 688, 195	58, 733	2, 864, 430	3, 282, 842	94, 192	3, 340, 434	3, 979, 631
Michigan	3, 610, 648	86, 370, 028	86, 370, 028	4, 952, 264	121, 712, 365	121, 712, 365	5, 363, 160	138, 304, 080	138, 304, 080
Missouri			137, 591			797, 400			202, 556
Montana [3]	928, 795	46, 913, 200	48, 098, 730	3, 271, 464	153, 027, 726	165, 754, 442	4, 498, 616	214, 152, 224	224, 125, 264
Nevada	402, 842	10, 346, 763	10, 961, 491	629, 510	22, 464, 135	23, 133, 091	2, 834, 238	66, 111, 404	67, 204, 282
New Mexico	533, 609	13, 686, 274	14, 267, 338	1, 479, 059	31, 882, 619	31, 937, 207	2, 947, 371	61, 215, 980	61, 356, 802
North Carolina							157	61, 983	61, 983
Oregon	2, 398	174, 300	174, 300	17, 117	1, 012, 189	1, 046, 525	18, 940	1, 261, 954	1, 283, 476
Pennsylvania			313, 302			1, 229, 926			1, 703, 480
Tennessee	564, 457	15, 084, 294	15, 084, 294	557, 750	14, 240, 571	14, 240, 571	776, 477	18, 721, 932	18, 721, 932
Texas				73	4, 290	4, 290	48	3, 080	4, 257
Utah [3]	1, 359, 621	27, 431, 494	30, 891, 403	4, 510, 652	90, 648, 695	97, 193, 850	11, 520, 693	209, 666, 238	222, 393, 572
Washington	1, 332	246, 017	251, 544	6, 086	312, 912	317, 203	12, 070	870, 309	871, 999
Wyoming	50	10, 000	10, 000	24	4, 296	4, 296	584	111, 280	111, 280
	13, 410, 630	456, 133, 699	466, 190, 853	26, 945, 617	937, 203, 237	964, 583, 894	45, 681, 498	1, 438, 993, 887	1, 477, 739, 709

[1] A quantity of copper was recovered from old slags and ores not classed as copper ores.
[2] Most of the copper from Colorado is derived from ores classed as siliceous ores and lead ores.
[3] Considerable copper was recovered as precipitates from mine waters and from ores not classed as copper ores.

Copper ores produced in the United States, 1917–1924, and average yield in copper, gold, and silver

Year	Smelting ores		Concentrating ores		Total				
	Short tons	Yield in copper (per cent)	Short tons	Yield in copper (per cent)	Short tons	Yield in copper (per cent)	Yield per ton in gold (ounce)	Yield per ton in silver (ounce)	Value per ton in gold and silver
1917	7,438,068	4.39	51,044,626	1.19	58,482,694	1.60	0.0058	0.347	$0.49
1918	6,223,674	4.51	53,937,796	1.18	62,289,069	1.51	.0050	.328	.50
1919	3,465,880	4.64	30,769,966	1.35	36,121,622	1.65	.0052	.356	.51
1920	3,200,509	4.89	31,348,340	1.34	36,765,370	1.63	.0047	.331	.46
1921	1,235,602	4.77	11,022,544	1.44	13,396,382	1.70	.0039	.357	.44
1922	2,278,047	5.36	23,258,970	1.43	26,893,247	1.74	.0049	.386	.49
1923	3,496,728	5.12	40,209,754	1.29	45,519,317	1.58	.0060	.321	.39
1924	3,554,915	5.08	44,427,264	1.33	49,178,315	1.59	.0063	.325	.35

REVIEW BY COMPANIES AND STATES

SCOPE OF DISCUSSION

This section briefly summarizes the conditions affecting production in the principal copper districts of the country. The tenor of the ore from each district is given, so far as it does not disclose the production of those individual companies whose figures of output have not already been published in their annual reports or elsewhere. More detailed information on the mining operations of the districts is given in the reports on mine production.

In this report the individual companies' figures for metal output, ore reserves, metal content, and recovery in treatment, unless otherwise stated, are quoted from the published official reports of the companies. The chapter on copper in Mineral Resources for 1915 contains a map showing the location of the copper-producing districts and the metallurgical plants and also a brief discussion of the geologic occurrence of the ores in the several districts.

In 1925 the American Smelting and Refining Co. had available for dividends, after deducting all charges, taxes, bond interest, depreciation, and depletion, a net income of $15,190,760.28, compared with $11,186,990.71 in 1924; in view of the larger earnings the company, on November 1, 1925, raised the dividend on common stock to 7 per cent a year. During the year the company expended $6,939,787.34 in new undertakings, enlargements, and betterments, without additional financing; $1,953,242.05 for these purposes was paid out of funds provided by special financing Series B bonds in 1923. Statistics of the company's operations for several years are given in the following table:

Operations of the American Smelting & Refining Co., 1921–1925

	1921	1922	1923	1924	1925
PRODUCTION					
Gold ounces	1,780,205	1,744,550	1,871,790	1,868,407	1,667,849
Silver do	75,354,443	84,793,931	94,424,778	92,229,349	82,223,189
Platinum and palladium do	863	1,165	1,615	1,998	(1)
Lead short tons	207,612	252,898	338,284	412,416	455,261
Copper pounds	348,888,000	433,548,000	834,340,000	[2]522,472	[2]502,831
Zinc do	14,628,614	35,040,000	59,813,434	[2]39,450	[2]45,246
Nickel do	120,080	314,586	452,388	(1)	(1)
Tin do	11,915,954	3,766,000	5,166,458	[2]486	(1)
Sulphuric acid do	9,952,000	28,494,000	66,386,000	[2]35,259	(1)
Arsenic do	5,155,522	11,203,052	14,838,789	[2]10,473	(1)
Copper sulphate do	2,237,471	2,274,000	2,060,000	(1)	(1)
By-product metals do	3,232,488	12,700,577	13,392,509	20,146,769	(1)
Sulphur dioxide do	154,794	1,611			(1)
OPERATING STATISTICS					
Number of men employed exclusive of Mexico and South America	7,426	8,994	[3]25,477	[3]25,765	[3]26,401
Total wages and salaries	$11,205,547	$12,981,167	(1)	(1)	(1)
Average wage per day	$4.19	$4.01	(1)	(1)	(1)
Charge smelted short tons	2,583,142	3,845,849	5,083,655	5,160,236	5,638,730
Bullion refined do	357,062	477,890	760,602	898,390	936,346
Coal used do	302,924	300,556	527,985	447,710	390,981
Coke used do	263,384	376,045	480,904	436,459	517,401
Fuel oil used barrels	758,937	1,145,212	1,927,055	2,046,663	2,268,267
Gas used cubic feet	837,012,321	1,684,226,523	3,427,713,457	4,257,998,000	5,432,356,000
Ore mined short tons	2,205,537	2,738,463	2,600,249	1,551,259	1,656,212
Coal mined do	360,952	460,144	543,634	501,779	433,440
Coke produced do	100,860	126,968	171,780	206,189	323,384

[1] Not given.
[2] Short tons.
[3] Report does not specify "exclusive of Mexico and South America" in 1923, 1924, and 1925.

ALASKA

The output of blister copper from Alaska ores was 72,204,166 pounds in 1925, a decrease from 77,053,492 pounds in 1924. The 1925 production raised Alaska's total recorded production to 953,064,189 pounds, 2.66 per cent of the country's total, and moved Alaska from eighth to seventh place among the copper-producing States. California dropped from sixth to eighth place in 1925 and allowed both New Mexico and Alaska to advance. In smelter production for 1925 Alaska ranked seventh, also, with 4.31 per cent of the total production of the country.

Prince William Sound.—The Beatson mine of the Kennecott Copper Corporation produced 493,005 tons of ore, having an average copper content of 1.663 per cent and 0.29 ounce silver to the ton. The mill treated the entire tonnage, yielding 32,985 tons of concentrates, with a copper content of 21.09 per cent—a recovery of 84.84 per cent. In 1924 the production amounted to 479,915 tons of ore, averaging 1.70 per cent copper; it yielded 29,959 tons of concentrates, averaging 23.78 per cent copper—a recovery of 87.08 per cent.

Copper River district.—At Kennecott 136,836 tons of ore were produced, containing an average of 10.72 per cent copper and 2.20 ounces silver to the ton. Of this quantity 132,014 tons were treated at the mill at Kennecott, and 24,852 tons of concentrates, with an average content of 40.82 per cent copper, were produced, representing a recovery of 94.24 per cent. In 1924, 113,531 tons of ore, containing an average of 12.46 per cent copper, were mined at Ken-

necott. Of this quantity 99,240 tons were milled and yielded 15,773 tons of concentrates, assaying 39.2 per cent copper. The leaching plant produced 1,592 tons of precipitates containing 1,171 tons of copper. This represented a recovery of 92.44 per cent for copper from all ores treated in milling and leaching plants. The net earnings of the Kennecott Copper Corporation, after allowance for depreciation at all properties, amounted to $5.34 a share. Dividends totaling $3 a share were disbursed to stockholders in 1925 in equal quarterly payments, and on November 16, 1925, the directors increased the quarterly distribution, payable January 2, 1926, to $1 a share.

The mines of the Mother Lode Coalition Mines Co. in 1925 produced 156,308 tons of ore, containing an average of 10.38 per cent copper and 1.68 ounces silver to the ton. The shipments to the smelter were 34,057 tons containing 30,276,340 pounds of copper and 244,904 ounces of silver. The cost of producing copper in 1925, delivered to consumer, after charging in depreciation and taxes and crediting silver, was 7.22 cents a pound, compared with 6.87 cents a pound in 1924. Development and exploration work totaling 10,222 feet disclosed no new ore bodies. The mines produced 138,447 tons of ore in 1924, containing an average of 12.40 per cent copper and 1.94 ounces silver to the ton, and shipped to the smelter 34,480 tons of ore and concentrates which contained 31,417,540 pounds of copper and 245,901 ounces of silver.

ARIZONA

Arizona is the most important copper-producing State, both in production for 1925 and in total production for the country from 1845 through 1925. In 1925 Arizona produced 722,653,457 pounds of copper, 43.15 per cent of the total for the United States; Montana, the nearest competitor, produced 16.16 per cent. Arizona's production in 1918, 769,521,729 pounds of copper, was the largest output ever made by one State; the production for 1925 ranks next. The State's total production through 1925 is 10,939,638,700 pounds, 30.56 per cent of the country's total of 35,802,060,557 pounds. Montana has produced 25.06 per cent of the total, and Michigan 20.96 per cent. Arizona came into the lead in total production in 1920. In 1919 Montana stood first with 27.59 per cent of the total production and Arizona was a close second with 27.45 per cent. The methods of mining copper in Arizona have been described by Young.[3]

Bisbee district.—The Bisbee district produced more copper during the period from 1845 through 1925 than any other district in Arizona, but in recent years the Globe-Miami district has been making a considerably larger annual production. Among the country's copper-producing districts leading in total production, Bisbee, with a total recorded production through 1925 of 3,315,157,000 pounds of copper, ranks next to the Butte and Lake Superior districts. Bisbee ranked sixth in production for 1925.

[3] Young, G. J., "Methods of mining copper in Arizona": Eng. and Min. Jour.-Press, vol. 121, pt. 1, Mar. 13, 1926, pp. 437–441; "Methods of mining copper in Arizona": Eng. and Min. Jour.-Press, vol. 121, pt. 2, Mar. 20, 1926, pp. 476–483.

Copper produced in Bisbee district, Ariz., 1918–1925, in pounds

1918	160, 456, 000	1922	79, 591, 000
1919	122, 311, 000	1923	123, 884, 000
1920	118, 448, 000	1924	140, 630, 000
1921	37, 249, 000	1925	145, 433, 000

The Phelps Dodge Corporation, its branches and subsidiaries, produced ores in 1925 which yielded the following metals: Copper, 207,175,518 pounds; lead, 7,463,906 pounds; silver, 1,780,690 ounces; and gold, 41,165 ounces. Its purchased ores yielded 1,936,058 pounds of copper, 156,840 ounces of silver, and 3,486 ounces of gold. The corporation sold a total of 287,884,234 pounds of copper at an average net price f. o. b. refinery of 14.044 cents a pound.

Operations at the limestone mines of the Copper Queen branch were normal, shovel operations at Sacramento Hill showed a material decrease in the proportion of waste to ore, and with depth the grade of the ore and the cost of mining were more satisfactory. The concentrator ran at about 70 per cent capacity. Throughout the year the management endeavored to obtain a high-grade concentrate and a satisfactory extraction at the mill, but experiments were unsatisfactory. The company reported that a section of the concentrator was being reconstructed on a new flow sheet, involving finer grinding and different selective reagents in flotation, with the hope that it would give the desired results. Owing to the increase in the proportion of fine concentrates to coarse ores treated at the company's smelter in recent years, the blast furnace dust loss has become excessive; the company decided, therefore, to increase the number of reverberatory furnaces and to discontinue the use of the blast furnaces except in emergencies. The new installation will consist of two additional reverberatory furnaces with superimposed 11-hearth roasters; the gases from both furnaces and roasters will pass first through Cottrell dust collectors and thence discharge into a 300-foot stack. At the concentrator 1,300,248 tons of ore, averaging 1.59 per cent copper, were milled. The ratio of concentration was 5.95 into 1, the total copper recovery was 87.97 per cent, and the sulphide recovery was equivalent to 92.65 per cent.

The company is also carrying on leaching operations. The first wash of that part of the heap to which irrigation is being confined was completed in July, 1925. From the beginning of leaching operations up to January 1, 1926, 30 per cent of the estimated copper content of the part of the heap being treated had been extracted—a recovery that exceeds the original estimates. The precipitation plant had an apparent recovery of 94.4 per cent. Regular dividends totaling 4 per cent were declared during the year.

Metals produced by Copper Queen Consolidated Mining Co., 1918–1925

Year	Ore	Copper	Silver	Gold	Lead	Zinc
	Short tons	*Pounds*	*Ounces*	*Ounces*	*Pounds*	*Pounds*
1918	771, 063	90, 988, 156	558, 433	16, 409	1, 234, 497	----------
1919	606, 386	68, 614, 002	492, 326	10, 813	9, 372	----------
1920	832, 172	71, 443, 396	486, 698	8, 846	243, 836	----------
1921	515, 632	30, 610, 173	495, 179	4, 650	4, 916, 418	----------
1922	389, 367	47, 962, 123	1, 132, 304	11, 972	8, 560, 525	247, 793
1923	1, 189, 570	87, 935, 334	935, 729	19, 151	6, 307, 412	610, 709
1924	2, 022, 196	109, 117, 018	906, 521	29, 850	6, 094, 613	----------
1925	1, 940, 737	116, 379, 978	1, 079, 733	32, 007	7, 103, 853	----------

Metals produced by Copper Queen branch of Phelps Dodge Corporation in 1925

	Ore, dry weight	Gold	Silver	Copper	Lead	Manganese
Underground limestone:	*Short tons*	*Ounces*	*Ounces*	*Pounds*	*Pounds*	*Pounds*
Copper	520,692	22,772	580,828	63,256,830		
Silver	634	110	10,024	2,331		
Silver-lead	34,396	1,510	221,804	585,439	7,103,853	
Manganese	94					81,923
	555,816	24,392	812,656	63,844,600	7,103,853	81,923
Underground porphyry:						
Smelting	7,995		1,084	369,224		
Milling	44,244	193	2,863	1,719,456		
	52,239	193	3,947	2,088,680		
Sacramento Hill:						
Smelting	76,148	129	21,793	9,518,110		
Milling	1,255,165	7,280	240,992	39,794,449		
Lease ore	623	13	344	110,293		
	1,331,936	7,422	263,129	49,422,852		
Precipitates: Leach heap	746		1	1,023,846		
	1,940,737	32,007	1,079,733	116,379,978	7,103,853	81,923

The smelter of the Calumet & Arizona Mining Co. produced 103,949,220 pounds of blister copper in 1925, compared with 79,025,610 pounds in 1924, the largest output ever made by this company. The large increase is due to the treatment in 1925 of concentrates from the new flotation mill of the New Cornelia Copper Co. The 681,662 dry tons of ore and concentrates treated at the smelter were obtained from the following sources:

Calumet & Arizona Mining Co. ore:	Short tons
Bisbee	450,166
85 branch	108,128
New Cornelia concentrates	85,927
Custom ore	37,441
Total	681,662

The Cottrell dust-collecting system, completed in 1924, in connection with the roasting department, was successful in 1925; during the year it recovered a daily average of 53 tons of roaster dust containing 21,000 pounds of copper. The new dust chamber of the converter department recovered daily an average of 3.5 tons of converter dust containing 2,800 pounds of copper. The acid plant ran from April 20 to October 20, 1925, and produced 10,602.37 tons of 60° acid.

At the Campbell shaft of the Junction mine, on the 1,800-foot level, a large mineralized zone has been developed in which several bodies of high-grade ore are reported to have been found. Dividends totaling $4 a share were paid in 1925, compared with $2 a share in 1924.

Metals produced by Calumet & Arizona Mining Co., 1918–1925

Year	Refined copper produced (domestic)	Gold	Silver	Dividends
	Pounds	*Ounces*	*Ounces*	
1918	50, 909, 373	31, 308	906, 210	$5, 140, 062
1919	44, 991, 107	28, 530	995, 366	1, 927, 563
1920	42, 430, 847	32, 520	932, 489	2, 570, 084
1921	17, 855, 613	12, 365	419, 647	1, 285, 043
1922	30, 830, 615	23, 349	642, 174	1, 285, 047
1923	42, 166, 930	35, 693	824, 768	2, 248, 849
1924	41, 582, 030	31, 934	813, 791	1, 285, 063
1925	44, 557, 219	37, 287	832, 434	2, 571, 028

During the year the Shattuck Arizona Copper Co. and the Denn-Arizona Copper Co. were consolidated to form the Shattuck Denn Mining Corporation. At special meetings on October 26, 1925, the stockholders of the two companies authorized the sale of the assets of their respective companies to the above corporation. The figures below cover the operations of the Shattuck mine through October and the Shattuck and Denn mines for November and December.

Metallic production of the Shattuck Denn Mining Corporation in 1925

Shattuck mine, Jan. 1 to Oct. 31, 1925:		
Copper ore mined	wet short tons	15, 884. 28
Copper ore shipped	do	15, 884. 28
Copper ore treated	dry short tons	14, 717. 01
Average moisture in copper ore	per cent	7. 40
Lead ores mined—		
Shipping ore	wet short tons	12, 365. 70
Milling ore	do	28, 824. 90
Lead ores shipped—		
Shipping ore	do	12, 365. 70
Milling ore	do	28, 699. 90
Lead ores treated—		
Shipping ore	dry short tons	14, 270. 38
Milling ore	do	26, 987. 13
Lead concentrates treated	do	2, 987. 52
Copper recovered	pounds	1, 560, 494
Gold from copper ores	ounces	605. 83
Silver from copper ores	do	30, 628
Lead recovered—		
From ore treated	pounds	1, 132, 451
From concentrates treated	do	1, 729, 482
Gold from lead ores and concentrates	ounces	2, 686. 78
Silver from lead ores and concentrates	do	172, 213
Shattuck and Denn mines, November and December, 1925:		
Copper ore mined	wet short tons	2, 011. 76
Copper ore shipped	do	2, 011. 76
Copper ore treated	dry short tons	1, 855. 03
Average moisture in copper ore	per cent	7. 62
Lead ores mined—		
Shipping ore	wet short tons	447. 52
Milling ore	do	8, 387. 70
Lead ores shipped—		
Shipping ore	do	447. 52
Milling ore	do	8, 549. 70
Lead ores treated—		
Shipping ore	dry short tons	500. 40
Milling ore	do	8, 975. 32
Concentrates treated	do	1, 323. 35
Copper recovered	pounds	268, 205

Shattuck and Denn mines, November and December, 1925—Con.		
Gold from copper ores	ounces	27. 31
Silver from copper ores	do	3, 618
Lead recovered—		
From ores treated	pounds	75, 085
From concentrates treated	do	820, 793
Gold from lead ores and concentrates	ounces	590. 37
Silver from lead ores and concentrates	do	45, 421

Metals produced by Shattuck Denn Mining Corporation, 1918–1925

[Shattuck Arizona Copper Co. prior to 1925]

Year	Copper	Silver (from copper ores)	Gold (from copper ores)	Lead recovered	Copper recovered	Dividends
	Pounds	*Ounces*	*Ounces*	*Pounds*	*Per cent*	
1918	9, 081, 959	161, 230	1, 220	2, 420, 690	4. 83	$437, 500
1919	2, 111, 841	89, 724	300	4, 432, 655	4. 74	[1] 262, 500
1920	2, 374, 148	73, 718	575	8, 254, 603	6. 19	
1921[2]	287, 928	12, 093	29		7. 94	
1922						
1923	3, 223, 209	157, 124	1, 349	1, 590, 682	6. 42	
1924	2, 630, 185	72, 671	754	5, 244, 526	6. 44	
1925	1, 828, 699	34, 246	633	3, 757, 811	5. 52	

[1] Capital distribution through 1924 to the amount of $1,487,500.
[2] Result of development work only. No productive operations carried on.

Globe-Miami district.—For several years the Globe-Miami district has been the most important copper-producing district in Arizona, ranking second to Bisbee district in total production for the period from 1845 through 1925. The total recorded production of copper in the Globe-Miami district through 1925 was 2,432,490,000 pounds, and the production for 1925 was 175,272,000 pounds. In total output the Globe-Miami district ranks fifth among the copper-producing districts of the country, and in output for 1925 third.

Copper produced in Globe-Miami district, Arizona, 1917–1925, in pounds

1917	169, 490, 000	1922	170, 035, 000
1918	201, 806, 000	1923	198, 426, 000
1919	171, 106, 000	1924	190, 452, 000
1920	176, 215, 000	1925	175, 272, 000
1921	76, 488, 000		

The smelter of the Old Dominion Co. remained idle throughout the year, but was maintained in good condition for use. The high-grade smelting ore and all of the concentrates were shipped to the International smelter at Miami, and were refined at Raritan, N. J. Mining and concentrating operations were normal. The tonnage mined, 355,623 tons, was the highest in the history of the mine, excepting that of 1916, 358,223 tons. The copper content of both smelting and concentrating ores increased in 1925, but because of the higher proportion of concentrating ore to smelting ore the average grade of the ore extracted decreased from 4.62 to 4.16 per cent copper. Concentrating costs decreased 16 cents a ton from those of 1924 because of the larger quantity handled.

Ore produced by Old Dominion Co. in 1925

	Short tons	Percentage of copper
Smelting ore	13,370	8.54
Concentrating ore	342,015	3.99
Converting ore	238	1.43
	355,623	4.16

Metals produced by Old Dominion Co., 1918–1925 [1]

Year	Ore	Refined copper	Gold	Silver	Average grade of ore in copper	Dividends
	Short tons	*Pounds*	*Ounces*	*Ounces*	*Per cent*	
1918	230,451	33,378,158	5,071	184,982	4.52	$1,188,284
1919	253,686	28,166,396	5,756	137,071	4.28	
1920	249,111	22,854,452	3,484	181,010	4.79	
1921	61,753	7,389,648	1,187	71,155	5.31	
1922	202,954	18,573,289	3,317	122,095	5.14	
1923	289,695	26,764,801	5,137	190,033	4.95	
1924	294,999	25,400,670	5,531	155,814	4.62	
1925	355,623	27,283,655	5,752	150,782	4.16	

[1] Includes custom metals produced.

The Miami Copper Co. obtained splendid results during the year. At the beginning of 1925 their reserves were as follows: High-grade sulphide ore, 4,034,505 tons, containing an average of 2.08 per cent copper; mixed sulphide and oxide ore, 6,000,000 tons, averaging 2 per cent copper; and low-grade ore, 36,000,000 tons, averaging 1.06 per cent copper. As only the high-grade ore had been mined, and as the reserves of this ore were being rapidly exhausted and only 1,500,000 tons of it were readily available for mining, the company decided to enlarge the capacity of the plant from 6,800 to 10,000 tons a day in the hope that a profit could be made by treating more low-grade ore with some high-grade ore. The enlarged plant was completed in 1925, and after October 1 was operating at the new capacity. For the last three months of the year the company treated low-grade ore entirely. The cost of producing copper in 1925 was less than that the company in 1924 had hoped to achieve. During the last three months of the year the cost was slightly less than 12 cents a pound. These results indicate that ore of lower grade than what had been deemed commercial ore could be included in the reserves. In consequence, the reserves at the end of 1925 are more than one and one-half times as large as those reported at the end of 1924. Four quarterly dividends were paid during the year, 50 cents for first quarter and 25 cents for each of the other three quarters, totaling $1.25 a share.

Copper produced by Miami Copper Co., 1918–1925

Year	Ore	Copper content	Mill extraction	Refined copper	Dividends
	Short tons	*Per cent*	*Per cent*	*Pounds*	
1918	2,132,941	2.026	71.15	58,407,563	$3,362,013
1919	1,698,446	2.040	82.38	54,221,638	1,867,785
1920	1,801,958	1.968	82.48	55,581,328	1,494,228
1921	1,868,757	1.758	85.37	53,311,941	1,494,228
1922	2,183,020	1.883	86.36	67,454,447	1,494,228
1923	2,380,155	1.697	83.98	64,448,345	1,494,228
1924	2,444,079	1.624	80.17	60,475,547	1,494,228
1925	2,919,600	1.287	72.60	51,851,274	933,893

Milling operations of Miami Copper Co. in 1925

Ore milled	short tons	2,919,600
Copper in ore	per cent	1.287
Concentrates produced	short tons	97,770
Copper in concentrates	per cent	27.911
	pounds	54,577,076
Copper recovered per ton of ore	do	18.693
Mill extraction	per cent	72.60

Cost of copper in concentrates f. o. b. cars at Miami, Ariz., in 1925

	Per ton of ore	Per pound of copper
Mining	$0.85342	$0.04805
Milling	.57162	.03219
General	.19483	.01097
	1.61987	.09121

Ore reserves of Miami Copper Co., January 1, 1926

	Short tons	Percentage of copper
High-grade sulphide ore	[1]	[1]
Mixed sulphide and oxide ore	7,000,000	1.83
Low-grade sulphide ore	67,917,514	1.01
	74,917,514	

[1] The high-grade sulphide ore reserves, 2,801,570 tons, are associated with the low-grade ore body and with the mixed ore body and can most economically be mixed with these ore bodies so they have been included with them.

In 1925 the Inspiration Copper Co. produced 5,058,324 tons of ore, containing an average of 1.038 per cent copper. The ore mined in 1924 contained 1.135 per cent copper. In both 1924 and 1925 the copper content of the ore mined was less than expected, apparently because of difficulties encountered in mining the ore of the Live Oak section. Better results are expected for 1926. As a result of the large amount of development work done in 1925, the output per man-shift was only 10.67 tons for all labor chargeable to mining ore, as compared with 17.5 tons in 1924. In the Inspiration section 85,789 feet were developed, compared with 45,365 feet in 1924, and in the Live Oak section 44,573 feet were developed, compared with 17,715 feet in 1924. In addition 11,280 feet of churn and diamond drilling

were done in these two sections. Experiments were made with leaching to determine operating procedure and to test various materials to be incorporated in the construction of the 7,500-ton leaching plant. Construction of this plant began in 1925, and the plant was expected to be in operation in October, 1926. Dividends totaling $1,772,950.50 were paid during the year.

Mill statistics, Inspiration Consolidated Copper Co. in 1925

Total ore milled	dry tons	5,053,219
Ore milled per day	do	14,037
Average number of sections running		14.9
Average rate per section	tons	940
Screen analysis of feed (on 48 mesh)	per cent	3.8
Assay mill feed	per cent of copper	1.033
Copper in feed, oxidized	per cent	.177
Copper assay of general tailings	do	.215
Copper in general tailings, oxidized	do	.166
Copper in general concentrates, smelter assay	do	35.183
Copper in flotation concentrates	do	38.07
Copper in table concentrates	do	3.94
Moisture in general concentrates	do	8.23
Ratio of concentration		42.5
Recovery of copper (calculated from smelter assays):		
Assays only	per cent	79.67
Assays and weights of concentrates and ore	do	80.19
Assays and weights of concentrates and tailings	do	79.78
Assays and weights of ore and tailings	do	79.67
Recovery of copper sulphides	do	94.41
Water used per ton of ore	tons	1.234
Power used per ton of ore milled:		
Coarse crushing	kilowatt-hours	0.46
Fine grinding and concentrating	do	10.30
Blowers for flotation air	do	1.75
Filtering and reclaiming water	do	1.00
Lighting	do	.14
		13.65
Steel balls consumed in fine grinding per ton of ore milled	pounds	1.58

Copper produced by the Inspiration Copper Co. in 1925

	Ore treated (tons)	Copper produced (pounds)
Inspiration concentrating ore	3,521,172	55,563,960
Live Oak concentrating ore	1,531,703	25,606,128
Inspiration ore to smelter	7,386	173,619
Warrior ore to smelter	5,928	581,604
Live Oak ore to smelter	905	13,646
	5,067,094	81,938,957
From leaching tests	344	5,364
	5,067,438	81,944,321

The mine of the Iron Cap Copper Co. was active throughout the year. The mill was operated only six months, owing to litigation started by the Arizona Commercial Mining Co. over the western section of the Iron Cap company's mine, the main source of the mill ore. The courts gave the Iron Cap company clear title, and at the end of the year preparations were being made to resume work at the mill.

Metallic production of the Iron Cap Copper Co., 1920–1925

	1920	1921	1922	1923	1924	1925
Ore (dry weight)—short tons	91,326	4,424	69,675	83,931	83,312	55,035
Silver recovered—ounces	113,323	4,002	72,005	75,982	85,680	149,513
Copper recovered—pounds	8,235,670	385,548	5,829,122	6,134,162	5,383,059	4,566,501
Average price received:						
Per ounce of silver	$1.083	$1.015	$0.9952	$0.77826	$0.6725	$0.689
Per pound of copper	$0.17444	$0.12580	$0.13425	$0.14446	$0.13024	$0.13949

Result of mill operation of the Iron Cap Copper Co. in 1925

Ore milled (dry)—short tons		34,580
Average assay of feed	per cent of copper	3.19
	ounces of silver per ton	1.03
Copper contained in ore—pounds		2,212,024
Silver contained in ore—ounces		35,742
Concentrates produced (dry)—short tons		4,771
Average assay of concentrates	per cent of copper	21.45
	ounces of silver per ton	6.50
Copper contained in concentrates—pounds		2,047,423
Silver contained in concentrates—ounces		31,020
Tailings rejected (dry)—short tons		29,808
Average assays of tailings	per cent of copper	.276
	ounce of silver per ton	.158
Copper contained in tailings—pounds		164,601
Silver contained in tailings—ounces		4,721
Recovery of copper—per cent		92.56
Recovery of silver—do		86.79
Operating cost per dry short ton		$1.61

In 1925 the Arizona Commercial Mining Co. produced 75,499 tons of ore containing an average of 5.91 per cent copper. During the year the company paid two dividends of 50 cents a share.

Copper, gold, and silver produced by the Arizona Commercial Mining Co., 1919-1925

Year	Refined copper	Gold	Silver
	Pounds	*Ounces*	*Ounces*
1919	7,280,861	1,310	16,918
1920	7,913,836	1,722	31,028
1921	572,616	163	3,001
1922	6,220,923	1,585	27,532
1923	8,115,212	2,143	37,826
1924	7,760,931	1,883	32,634
1925	7,860,866	1,972	39,430

In 1925 the Superior and Boston Copper Co. shipped 14,432 dry tons of ore, containing an average of 3.75 per cent copper and 10.31 ounces of silver to the ton. For this the company received $133,396.15 in net smelter returns, after deducting freight and smelting charges, or an average of $9.24 a ton.

Morenci-Metcalf district.—The production of the Morenci-Metcalf district increased from 41,047,000 pounds in 1924 to 59,464,000 pounds in 1925. The total output of the district through 1925 was 1,657,518,000 pounds, placing it seventh among the copper-producing districts of the United States.

Copper produced in Morenci-Metcalf district, 1917–1925, in pounds

1917	53, 000, 000	1922	14, 175, 900
1918	71, 867, 000	1923	28, 735, 000
1919	44, 868, 000	1924	41, 047, 000
1920	35, 746, 000	1925	59, 464, 000
1921	11, 420, 000		

At the Morenci branch of the Phelps Dodge Corporation 1,528,277 dry tons of ore were produced, almost entirely from the Humboldt, Petaluma, and Clay mines. The No. 6 concentrator treated 1,486,896 tons of ore, and 127,264 tons of concentrates were shipped to the smelter at Clifton, which treated 179,717 tons of material and produced 59,272,857 pounds of copper. Improvements in mining and metallurgical methods at the Morenci branch are described in articles by McHenry Mosier and John Martin,[4] and by Arthur Crowfoot.[5]

Yavapai County.—The output of copper in Yavapai County, mostly from the Jerome district, in 1925 and in several preceding years is given in the table that follows. From the beginning of operations through 1925 Jerome ranks as the sixth most important district in the production of copper. The chief producers of the district are the United Verde Copper Co. and the United Verde Extension Mining Co.

Copper produced in Yavapai County, Ariz., 1917–1925, in pounds

1917	159, 612, 146	1922	76, 607, 502
1918	148, 882, 695	1923	147, 718, 492
1919	80, 227, 549	1924	143, 348, 230
1920	114, 937, 080	1925	154, 017, 340
1921	26, 576, 298		

Operations at the mine and smelter of the United Verde Extension Mining Co. were continuous during 1925. A total of 186,008 tons of ore, containing an average of 11.51 per cent copper, and 0.046 ounce of gold and 2.33 ounces of silver per ton, was mined; and 180,763 tons, containing 11.53 per cent copper, and 0.046 ounce gold and 2.34 ounces of silver per ton, were smelted. There were also 2,546 tons of custom concentrates smelted, and 4,170 tons of ore shipped. A total of 43,720,324 pounds of copper was produced. During the year the company paid quarterly dividends totaling $2.25 a share.

The mines and plants of the United Verde Copper Co. were continuously active throughout 1925.

Cost[6] of producing copper by United Verde Extension Mining Co. in 1925

	Cents per pound
Mining	2. 46
Smelting	2. 32
Freight on ore	. 08
Freight on bullion, refining, selling	1. 80
Other expenses	. 27
	6. 93

[4] Mosier, McHenry, and Martin, John, "Mining methods at Morenci": Eng. and Min. Jour.-Press, vol. 120, Dec. 26, 1925, pp. 1006–1012.

[5] Crowfoot, Arthur, "Evolution of copper-ore concentration at Morenci, Ariz.": Eng. and Min. Jour.-Press, vol. 120, Dec. 5, 1925, pp. 884–890

[6] Exclusive of depreciation, reserve to return capital (depletion), and taxes.

Copper produced by the United Verde Extension Mining Co., 1918–1925

Year	Ore treated	Copper produced	Silver	Gold
	Short tons	*Pounds*	*Ounces*	*Ounces*
1918	133,535	55,491,077	503,739	3,046
1919	93,325	28,860,615	272,855	3,169
1920	161,617	41,942,700	359,370	5,530
1921	53,643	12,498,005	112,864	2,328
1922	136,980	31,640,714	238,764	5,788
1923	172,629	41,855,959	257,602	8,992
1924	185,858	44,278,947	[1]	[1]
1925	[2] 183,309	43,720,324	[1]	[1]

[1] Figures not available.
[2] Includes 2,546 dry tons custom concentrates smelted.

Ray or Mineral Creek district.—In 1925 the Ray or Mineral Creek district produced 74,695,000 pounds of copper, compared with 67,854,000 pounds in 1924. The total recorded output of this district through 1925 was 817,342,000 pounds, placing it tenth among the important copper-producing districts of the country.

The Ray mines of the Ray Consolidated Copper Co. produced 3,051,839 tons of copper ore in 1925, a daily rate of 8,361 tons, compared with 2,916,618 tons, a daily rate of 7,969 tons, in 1924. Mining costs dropped from $1.10 a ton in 1924 to 98 cents in 1925. These costs do not include depreciation and the usual charge of 15 cents a ton to cover amortization of the cost of development. The estimated reserves at the Ray mines are 89,860,223 tons of ore, averaging 1.68 per cent copper. Since the beginning of operations 33,826,511 tons of ore has been mined.

Completion of the remodeling of the fine grinding and gravity concentration departments of the Hayden mill resulted in the flotation feed being more finely ground and of higher grade. Therefore the company decided not to move the old flotation equipment into the mill building, as it had planned, but to adopt a flotation cell of different dimensions.

Experiments showed that the cell developed at the Chino division was the most efficient for the new feed. Installation of the new flotation equipment using this type of cell began in April and was virtually completed at the end of the year. With this new flotation equipment the recovery of copper during the last quarter of 1925 was 88.20 per cent. The Hayden mill ran at less than full capacity, only six of the seven completed sections being kept in commission. There were 3,037,700 tons of ore milled in 1925, containing an average of 1.50 per cent copper, compared with 2,896,700 tons milled in 1924, containing an average of 1.52 per cent copper. The mining methods being used at Ray mines and the new flow sheet at the Hayden mill are described in the Arizona Mining Journal.[7]

[7] Thomas, R. W., "Mining methods being used at Ray mines": Ariz. Mining Jour., vol. 9, No. 22, Apr. 15, 1926, pp. 7–9. Garms, W. I., "Remodeled flow sheet at Hayden plant": Ariz. Mining Jour., vol. 9, No. 20, Mar. 15, 1926, pp. 5–8.

Copper produced by Ray mines of the Ray Consolidated Copper Co., 1918–1925

Year	Ore milled	Copper content	Mill recovery	Refined copper	Cost per pound [1]	Dividends and capital distributions
	Short tons	*Per cent*	*Per cent*	*Pounds*	*Cents*	
1918	3,411,000	1.613	74.92	83,599,160	17.695	$5,125,831
1919	1,621,600	1.814	79.45	46,011,371	15.62	3,154,358
1920	1,706,928	1.720	81.98	47,062,030	16.144	1,577,179
1921	406,172	1.646	77.82	10,110,131	16.41	
1922	1,178,350	1.587	76.66	27,953,408	[2] 12.41	
1923	2,689,800	1.571	74.87	61,385,205	[2] 12.03	
1924	2,896,700	1.523	78.27	67,017,981	[2] 11.30	
1925	3,037,700	1.500	84.45	74,691,091	[2] 10.84	

[1] Does not include amount received for gold and silver or miscellaneous income, 1918–1921.
[2] Includes amount received for gold and silver and miscellaneous income but not charges for depreciation. Comparative value for 1921 was 16.25 cents. In 1924 and 1925 the costs for the Ray and Chino mines were computed together.

Ajo district.—The New Cornelia Copper Co. mined and delivered to crushing plants for flotation concentration 2,334,263 wet tons (equivalent to 2,287,121 dry tons) of sulphide ore, containing an average of 1.391 per cent copper, 1.198 per cent in sulphides, and 0.193 per cent in oxides. There were 1,083,441 wet tons of carbonate ore (1,059,649 dry tons), averaging 1.157 per cent copper, mined and delivered to crushing plants for leaching operations. The ore averaged 1.059 per cent soluble copper and 0.098 per cent insoluble copper. The company estimates that the reserves of sulphide ore at the end of the year are as follows: 52,219,427 tons, containing an average of 1.31 per cent copper, and 2,363,896 tons, containing an average of 3.65 per cent copper. The reserves of carbonate ore are estimated to be 3,277,028 tons, averaging 1.25 per cent copper. The concentrating plant, which was designed to treat 5,000 tons of ore a day, handled a daily average of 6,582 tons. Rickard[8] has described the mining and metallurgical methods of the company. During the year distributions to stockholders totaled $1,800,000.

Copper produced by the New Cornelia Copper Co., 1921–1925, in pounds

	1921	1922	1923	1924	1925
Electrolytic copper	19,993,758	26,408,610	36,063,832	22,746,882	15,979,895
Cement copper	169,035	140,732	2,303,886	1,729,479	1,305,265
Copper in ore shipped	35,589	63,461			
Copper from concentrates				39,407,932	51,977,126
	20,198,382	26,612,803	38,367,718	63,884,293	69,262,286

Pioneer district.—The mine of the Magma Copper Co. produced 229,377 tons of ore of all classes, a daily average of 628 tons. This ore contained an average of 6.50 per cent of copper, 3.43 ounces of silver, and 0.031 ounce of gold to the ton. The net metal output for the year, after deduction of all losses, including those of refining, was 27,020,516 pounds of copper, 719,881.22 ounces of silver, and 9,085.653 ounces of gold. At the concentrator operations were continuous throughout 1925. The average assay of the mill heads was

[8] Rickard, T. A., "The later story of the New Cornelia enterprise": Eng. and Min. Jour.-Press, vol. 119, Feb. 14, 1925, pp. 285–289.

4.86 per cent copper and of the tailings was 0.207 per cent copper. The average recovery was 97.16 per cent. Two dividends of 75 cents a share, totaling $612,232.50, were paid during the year, and a third dividend was declared payable on January 15, 1926. The net cost of producing copper, after the deduction of gold and silver credits, was 7.51 cents a pound. This cost does not include allowances for depreciation and interest, but includes all other fixed and general expenses. Austin[9] has described the smelter.

CALIFORNIA

In California there was a falling off in the production of blister copper from 49,433,716 pounds in 1924 to 46,943,604 pounds in 1925. California ranked eighth among the copper-producing States in 1925 and eighth also in total production from the beginning of operations, the total production through 1925 being 940,045,638 pounds, 2.63 per cent of the country's total. Two smelters were active in California in 1925. The Mammoth plant of the United States Smelting, Refining & Mining Co. did not operate the entire year. During the year all the commercial ore in the Mammoth mine and other mining properties tributary to the copper smelter was declared exhausted by the company, and the entire property was closed down and scrapped. Plumas County and Shasta County furnished the greater part of the California output in 1925.

Shasta district.—The Shasta district produced 14,551,000 pounds of copper in 1925, compared with 21,056,000 pounds in 1924. As stated above the smelter of the United States Smelting, Refining & Mining Co. was closed down on September 1, and the equipment was scrapped. The Shasta district yielded a total output through 1925 of 614,738,000 pounds of copper and ranks eleventh in total production.

The Mountain Copper Co. (Ltd.) reports that its smelter was idle during the year because the price of copper was less than the cost of production.

Foothill district.—The Foothill district produced 4,893,000 pounds of copper in 1925, bringing its total production through 1925 up to 166,392,000 pounds.

Plumas district.—In 1925 the Plumas district produced 26,918,000 pounds of copper, compared with an output of 25,558,000 pounds in 1924. The Engels Copper Mining Co. is the most important producer in the district.

The Engels Copper Mining Co. produced 15,187,027 pounds of copper in 1925, bringing its total gross production of copper from the beginning of operations in 1914 to 108,304,025 pounds. The cost of production, exclusive of depletion, was 12.0564 cents a pound; the reduction of 1.045 cents a pound from the cost in 1924 was mainly due to the improved operating conditions at the plant. The average recovery at the Superior mill increased from 89.406 per cent in 1924 to 93.16 per cent in 1925, although ores of lower grade were treated. The experimental mill, equipped to investigate the "Pike"[10] process for treating ores and concentrates, was operated in 1925; the company's report says:

[9] Austin, L. S., "Features of the Magma copper smelter": Eng. and Min. Jour.-Press, vol. 121, Apr. 17, 1926, pp. 643–644.

[10] Allen, A. W., "Hydrometallurgy": Eng. and Min. Jour.-Press, vol. 121, Jan. 16, 1926, pp. 112–114.

From extensive tests made it has been demonstrated that with this proce can be extracted copper, iron, gold, silver and sulphur. Treating the values gold, silver, and sulphur as a credit against the cost of production of copper an iron, indications are that 1 pound of copper and 1.2 pounds of iron can be pr duced for a cost of 12.87 cents; that is, cost of producing concentrate is 8.2 cents, royalty one-tenth cent, treatment cost of process 4.5 cents. This include depreciation and all charges, but no depletion. With copper selling at 14 cent and electrolytic iron at 6 cents a pound, the product is worth 20 cents, with production cost of 12.87 cents. The quality of the iron produced makes it new product and superior to any now on the market.

In order to utilize the process and reap the profits indicated, the next step is t ascertain the best market for the iron and to formulate a plan of financing an building a plant. This will be taken up by the management as soon as possibl and given earnest consideration.

Dividends totaling $371,470.43 were paid during the year.

Cost of producing copper by Engels Copper Mining Co. in 1925

		Total	Per pound of copper
			Cents
Operating cost		$1,032,873.23	6.8010
Freight and smelting charges	$729,275.04		
Credit value of gold and silver recovered	154,286.16		
		574,988.88	3.7861
Operating and marketing cost		1,607,862.11	10.5871
Depreciation costs	$106,765.18		
Development amortization	116,386.35		
		223,151.53	1.4693
		1,831,013.64	12.0564

Operations at Superior mill in 1925

Ore milled	short tons	411,866
Average heads	per cent	1.979
Average tails	do	.216
Actual extraction	do	93.16
Concentrates produced	pounds	54,711,649
Average content of concentrates	per cent	27.758
Copper produced	pounds	15,187,028
Silver produced	ounces	192,697.4344
Gold produced	do	1,466.1563

Ore reserves of Engels and Superior mines, December 31, 1925, in short tons [1]

Mine	Blocked ore		Probable ore	Total
	In place	Broken in stopes		
Engels	800,797	217,103	635,526	1,653,426
Superior	304,986	138,946	340,250	784,182
	1,105,783	356,049	975,776	2,437,608

[1] Estimate includes ore in pillars. Does not include reserves containing less than 2 per cent copper.

Operations at the mine of the Walker Mining Co. were continuous throughout the year; 229,616 tons of ore were broken; 263,411 tons, containing an average of 2.432 per cent copper, were treated at the concentrator; and 25,079.01 tons of concentrates were produced.

The average recovery was 94.488 per cent, a decrease from the average of 95.84 per cent in 1924. There were sold to the smelter 26,015.58 tons of concentrates and ore containing 12,764,496 pounds of copper, 230,808.45 ounces of silver, and 8,749.911 ounces of gold.

COLORADO

Although Colorado ranks tenth among the copper-producing States of the country both in output for 1925 and in total recorded output from the beginning of operations through 1925, a very small proportion of the copper produced is from ores classed as copper ores. The blister production in 1925 amounted to 3,163,211 pounds, although of the 2,360,500 pounds of recovered copper reported by the mines only 286,410 pounds were produced from ores classed as copper ores. Colorado's output of copper is derived mainly from the treatment of mixed ores in which copper is a minor constituent. The ores include lead-silver ores and pyritic ores rich in gold and silver. No important district in the State now yields ore mainly valuable for copper. The total smelter output of copper in Colorado through 1925 was 305,906,343 pounds.

IDAHO

In 1925 the production of blister copper from Idaho amounted to 3,144,064 pounds, 0.19 per cent of the total for the country, placing Idaho eleventh among the copper-producing States. Idaho also ranks eleventh in total production through 1925, with a total of 127,912,221 pounds. The mine output of Idaho in 1925 was 3,297,443 pounds, of which the Alder Creek district furnished 2,356,000 pounds.

MICHIGAN

Lake Superior district.—In the production of copper from the beginning of operations through 1925 Michigan has been surpassed only by Arizona and Montana. The smelter production through 1925 was 7,504,977,527 pounds, 20.96 per cent of the total for the United States of 35,802,060,557 pounds. In smelter production for 1925 Michigan ranks fourth with an output of 138,029,764 pounds, 8.24 per cent of the country's total. The mine production of Michigan in 1925 was 155,157,488 pounds.

The Lake Superior district ranks second only to the Butte district in total production from the beginning of operations, with a total recorded mine production through 1925 of 7,483,009,000 pounds, compared with 8,917,426,000 pounds produced by the Butte district. In 1925 the Lake Superior district ranked fourth in mine production with an output of 155,157,000 pounds, and sixth in 1924 with an output of 135,663,000 pounds.

Copper ore produced in Lake Superior district, Mich., 1917–1925

Year	Short tons	Yield of copper (per cent)	Year	Short tons	Yield of copper (per cent)
1917	12,400,723	0.99	1922	4,952,264	1.23
1918	11,321,365	.96	1923	5,363,160	1.29
1919	7,690,253	1.16	1924	5,372,572	1.26
1920	5,938,967	1.30	1925	7,036,751	1.10
1921	3,610,648	1.20			

The mines of the Calumet & Hecla Consolidated Copper Co. produced 64,250,000 pounds of copper in 1925 at an average cost, including cost of selling but not charges for depreciation or depletion, of 11.26 cents a pound. The average price received for copper delivered was 14.23 cents a pound. The Calumet & Hecla reclamation plant at Lake Linden produced 20,278,000 pounds of refined copper from 2,125,000 tons of sand, and the Tamarack reclamation plant at Hubbell produced 6,679,000 pounds of refined copper from 606,605 tons of sand, a total output of 26,957,000 pounds of copper produced during this period at an average cost sold of 7.06 cents a pound. The new railroad from the Ahmeek mine to the Ahmeek mill went into operation early in September. Dividends totaling $1.50 a share were paid during 1925.

The Isle Royale Copper Co. treated 378,459 tons of rock and produced 9,543,000 pounds of refined copper, 25.22 pounds to a ton of rock, compared with 8,103,000 pounds of refined copper from 315,507 tons of rock, 25.68 pounds to a ton, in 1924. The company paid dividends totaling $1 a share in 1925.

Operations at the Calumet & Hecla reclamation plant at Lake Linden in 1925 and for the entire period of its operation

	1925	Since starting
Quantity treated ..... short tons	2,125,000	11,768,218
Assay headings ..... per cent	0.600	0.687
Assay tailings ..... do	.120	.179
Refined copper produced ..... pounds	20,278,000	121,007,924
Refined copper produced per ton treated ..... do	9.54	10.28

The Baltic, Champion, and Trimountain mines produced 23,277,718 pounds of refined copper in 1925, of which 14,298,916 pounds were for the Copper Range Co.; one-half of the Champion output belonged to St. Mary's Mineral Land Co. There were 591,068 tons of rock stamped, which yielded an average of 39.38 pounds of copper per ton, compared with 40.80 pounds per ton in 1924. During the six years, 1920 to 1925, the Baltic and Trimountain mines have worked at a loss, but in every year, except 1920, the profits of the Champion mine and the railroad have resulted in a net operating profit for the company. The Copper Range Co. paid dividends totaling $394,727 in 1925.

Copper produced by the Champion Copper Co., 1916–1925

Year	Rock stamped	Copper produced	Yield per ton	Cost per pound [1]	Price received	Net profits
	Short tons	*Pounds*	*Pounds*	*Cents*	*Cents*	
1916	936,656	33,601,136	35.87	7.80	25.28	$5,870,606.26
1917	776,036	27,550,343	35.50	10.50	28.73	5,050,171.57
1918	594,235	21,748,514	36.599	11.92	24.757	2,791,800.38
1919	503,030	19,886,917	39.534	11.62	18.67	1,399,714.19
1920	321,664	13,610,324	42.419	14.40	17.17	399,772.65
1921	531,780	20,719,307	39.018	9.82	13.329	719,955.51
1922	503,593	19,583,806	38.964	9.93	14.359	890,515.16
1923	449,130	18,412,630	41.03	11.14	14.86	738,871.98
1924	457,160	20,061,630	43.88	10.49	13.76	709,276.53
1925	414,645	17,957,605	43.308	11.73	14.258	497,764.43

[1] Excludes depreciation and depletion.

Copper produced by the Baltic mine, 1916–1925

Year	Rock stamped	Copper produced	Yield per ton	Cost per pound [1]	Price received	Net profits
	Short tons	*Pounds*	*Pounds*	*Cents*	*Cents*	
1916	369,287	12,425,804	33.65	10.85	25.28	$1,792,667.75
1917	325,342	11,214,861	34.47	13.77	28.73	1,678,323.39
1918	293,601	10,406,097	35.44	15.07	24.757	1,007,551.97
1919	235,832	7,864,653	33.35	17.53	18.67	89,305.51
1920	175,357	6,613,918	37.71	18.02	17.11	[2] 59,882.60
1921	195,816	7,608,847	38.86	14.15	13.078	[2] 81,668.95
1922	165,804	5,329,568	32.14	16.76	13.958	[2] 149,578.09
1923	137,801	4,877,248	35.51	18.42	14.626	[2] 189,880.94
1924	150,101	4,769,286	31.77	15.95	13.76	[2] 104,574.24
1925	140,958	4,255,069	30.18	17.74	14.25	[2] 148,517.14

[1] Excludes depreciation and depletion. [2] Deficit.

Copper produced by the Trimountain mine, 1916–1925

Year	Rock stamped	Copper produced	Yield per ton	Cost per pound [1]	Price received	Net profits
	Short tons	*Pounds*	*Pounds*	*Cents*	*Cents*	
1916	349,504	8,720,558	24.94	11.01	25.28	$1,236,048.91
1917	264,655	6,278,097	23.72	15.22	28.73	848,241.06
1918	201,433	5,343,586	26.52	19.50	24.757	338,533.03
1919	171,995	5,274,387	30.66	19.39	18.668	51,303.34
1920	116,768	3,532,025	30.24	25.51	17.115	[2] 247,390.52
1921	143,172	4,341,584	30.32	18.27	13.078	[2] 183,560.50
1922	130,913	4,116,100	31.44	16.46	14.359	[2] 67,576.58
1923	6,273	281,482	44.87	([3])	([3])	[2] 140,563.74
1924	8,159	278,259	34.10	([3])	([3])	[2] 87,053.47
1925	35,465	1,065,044	30.03	([3])	([3])	[2] 39,302.47

[1] Excludes depreciation and depletion. [2] Deficit. [3] Figures not given.

At the Mohawk mine 640,069 tons of rock were stamped in 1925, producing 22,698,300 pounds of mineral and mass copper, which yielded 15,819,922 pounds of refined copper, or 24.716 pounds of copper per ton of rock. At the Wolverine mine 43,663 tons of rock were stamped, producing 796,700 pounds of mineral and mass, which yielded 574,084 pounds of refined copper, or 13.148 pounds per ton. The copper rock in the Wolverine mine is virtually exhausted according to the company's report, from which the following extract is quoted:

> This mine was operated from January 1882, to November, 1884, and lay idle until August, 1890, having produced up to this time 1,979,378 pounds of copper. From August 1, 1890, to April 1, 1925, there were stamped 8,468,263 tons of rock, from which 186,817,719 pounds of copper were recovered, which amounts to 22.06 pounds of copper per ton of rock stamped.

The Mohawk Mining Co. paid four dividends in 1925, totaling $460,000.

Copper produced by the Mohawk and Wolverine mines in 1925

Rock hoisted	short tons	701,335
Rock stamped	do	683,732
Product of mineral	pounds	23,495,000
Refined copper produced	do	16,394,006
Yield per ton of rock treated	do	23,977
Cost per ton of rock hoisted		$1.904
Cost per ton of rock stamped		$1.953

Operating cost per pound of refined copper	cents	8. 14
Cost of taxes	do	. 33
Cost of smelting, freight, and marketing product, including eastern offices' expenses	cents	1. 69
		10. 17

In 1925 the Quincy Mining Co. produced 586,913 tons of copper rock and mass, which yielded 14,357,523 pounds of refined copper or 24.46 pounds of refined copper per ton. The quantity of copper rock hoisted at the mine was virtually the same as in 1924 but as the yield was slightly lower the output of refined copper declined about 480,000 pounds. The smelter operated throughout the year. During the earlier months of the year a small electrically driven screening system was installed at the stamp mill to increase the recovery of silver. A Tyler hummer vibrating screen separates the different sizes of copper and silver "mineral," the larger proportion of the silver falling with the fines. The coarse material is fed to a moving belt from which the silver is hand picked. This equipment is reported to have increased the recovery of silver. The 139,499 ounces of silver produced by this mine in 1925 represent the only silver recovered by Michigan copper mines in that year.

MONTANA

Among the copper-producing States Montana stands second only to Arizona in both copper output in 1925 and the total recorded output from the beginning of operations through 1925. The smelter output of the State in 1925 was 270,604,676 pounds, or 16.16 per cent of the total for the country, and the production through 1925 was 8,971,016,719 pounds or 25.06 per cent of the total. Unlike Arizona, which contains a number of important copper-producing districts, Montana has only one outstanding district, Butte. M. B. Milligan,[11] of the State board of equalization, has published an article on mine taxation in Montana.

Butte district.—The Butte district is the leading copper-producing district in the United States both in output for 1925 and in total output from the beginning of operations through 1925. The total output of its nearest competitor, the Lake Superior district, is more than 1,400,000,000 pounds less. Through 1925 Butte has produced a total of 8,917,426,000 pounds of copper, and in 1925 it produced 266,637,000 pounds. The Anaconda Copper Mining Co. is by far the most important producer in the district. The output of the Butte district for a number of years is given in the following table:

Copper and associated metals produced in Butte district, Mont., 1918–1925

Year	Copper	Gold	Silver
	Pounds		*Ounces*
1918	321,104,000	$899,007	15,011,555
1919	169,051,000	576,756	10,527,457
1920	176,399,000	643,595	10,570,676
1921	47,958,000	280,085	4,980,285
1922	165,374,000	540,936	10,394,811
1923	223,043,000	624,528	11,835,643
1924	247,364,000	730,646	11,859,290
1925	266,637,000	746,422	11,561,659

[11] Milligan, M. B., "Mine taxation in Montana": Eng. and Min. Jour.-Press, vol. 120, Dec. 26, 1925, pp. 1013–1015.

The annual report of the Anaconda Copper Mining Co. for 1925 says:

The mines of the company produced during the year 2,847,158.45 tons of copper ore; 7,990.04 tons of precipitates were produced from the water pumped from the mines. At the concentrator there were treated 2,999,891.77 tons of copper ore, and 16,079 tons of copper tailings were treated by the new combined leaching and flotation process. The Anaconda reduction works treated for all companies 3,145,626.63 tons of copper ore and other cupreous material. Of the total amount 2,750,735.99 tons of ore were produced by the mines of the company, 363,811.72 tons of ore were either purchased from or treated for other companies, 27,983.70 tons of material were shipped from the old plants at Anaconda and Great Falls, and 3,095.22 tons from the Great Falls zinc plant. There were produced 266,864,833 pounds of fine copper, 9,071,359.67 ounces of silver and 38,390.32 ounces of gold. Of this production 266,373,956 pounds of fine copper, 9,054,740.99 ounces of silver, and 38,390.32 ounces of gold were produced for your company. Construction of an extension to the refineries was authorized at an estimated cost of $1,180,000. This extension will increase the annual capacity of the refineries from 216,000,000 to about 300,000,000 pounds per annum. An anode scrap melting furnace is also included in the proposed extension. The provision of these facilities will enable the company to refine in Montana all copper produced there and deliver it to western and middle west points, thereby saving freight to the Atlantic seaboard. Work on this extension is proceeding satisfactorily, and it is expected that it will be completed about the middle of the current year. The output of the copper refinery at Great Falls was 210,552,163 pounds of cathodes, of which 197,952,750 pounds were melted into shapes at that point. During the month of August an extension of the rod mill was authorized at an estimated cost of $382,000. Work on this extension was partially completed at the end of the year. The mill at Great Falls rolled into rods 133,851,764 pounds of copper; 40,867,277 pounds of rods were drawn into wire, of which 14,453,655 pounds were made into strand; 43,041,411 pounds of rods were shipped from this mill to the Kenosha plant of the American Brass Co. to be drawn into wire. During the year a thorough study of power conditions of the Raritan plant was undertaken, resulting in the adoption of a plan for changing the power arrangements, and new equipment is now being installed. The expenditure on this improvement will amount to about $1,600,000. The capacity of the plant will be increased from 38,000,000 to 45,000,000 pounds of copper per month, and the cost of refining will be materially reduced. The increased capacity is being provided in anticipation of the production of copper from the Andes mines in Chile. The metal output of the plant was 405,803,075 pounds of fine copper, 20,578,003.06 ounces of silver, 128,590.602 ounces of gold, 28,335 pounds of selenium, 570 pounds of tellurium, 454,815 pounds of nickel sulphate, 1,054,000 pounds of copper sulphate, 253.92 ounces of platinum, and 748.14 ounces of palladium.

The copper operations of the company were conducted at less than full capacity. Operating profit and income from investments amounted to $33,077,229.48, as compared with $21,744,965.25 for 1924. The net profit, after all charges, including depreciation, bond interest, and discount, were deducted, amounted to $17,540,532.32, as compared with $6,719,215.49 for 1924. The American Brass Co.'s operations in 1925 were at a rate 26 per cent higher than the rate maintained in 1924, the previous record year, and established a new record of production, 653,268,973 pounds. Dividends totaling $9,000,000 were paid during the year by the Anaconda Copper Mining Co., compared with $2,250,000 in 1924.

Copper, gold, and silver produced by Anaconda Copper Mining Co. from company ores, 1918–1925

Year	Ore treated	Copper	Silver	Gold	Dividends
	Short tons	*Pounds*	*Ounces*	*Ounces*	
1918	4,350,446	272,923,031	10,076,748	64,318	----------
1919	1,794,358	129,781,031	6,744,262	42,526	$9,325,000
1920	1,828,380	138,763,065	6,420,026	32,530	6,993,750
1921	395,239	32,267,345	2,137,062	8,619	----------
1922	1,878,162	141,741,235	6,755,212	25,720	----------
1923	2,735,534	200,779,688	8,568,607	29,726	9,000,000
1924	3,017,417	238,247,038	8,345,841	37,689	2,250,000
1925	2,750,736	266,373,956	9,054,741	38,390	9,000,000

The Butte & Superior Mining Co. in 1925 produced 161,315 tons of copper ore, whose average metal content was: Copper, 12,152,967 pounds (3.77 per cent); gold, 633 ounces; silver, 925,350 ounces; lead, 779,213 pounds; and zinc, 7,945,018 pounds. The copper content of the ore produced was less than in 1924, but the copper content of the ore reserves is reported to show an increase. At the end of 1925 these reserves were estimated to be 219,501 tons, containing an average of 4.19 per cent copper, compared with 304,030 tons, containing an average of 3.8 per cent copper, at the end of 1924.

The smelter of the East Butte Copper Mining Co. closed in August, 1924, and in 1925 all ores from Butte were shipped to the Anaconda Copper Mining Co.'s reduction works at Anaconda for treatment. The company states that the Pittsmont mine in Butte is in better condition than it was a year ago, and that the estimated amount of ore developed during the year more than offset the amount removed. The operations of the company in 1925 are shown in the following table:

Operations of East Butte Copper Mining Co. in 1925

Ore mined (dry weight) Pittsmont	short tons	66,367
Average assay value, copper	per cent	4.88
Average assay value, silver	ounces	2.90
Copper produced	pounds	6,481,165
Silver produced	ounces	192,625
Gold produced	do	418
Ore milled and shipped, Silver Plume	short tons	19,984
Average assay value, silver	ounces	6.70
Average assay value, lead	per cent	.33
Silver produced	ounces	107,093
Lead produced	pounds	123,356
Gross value of metals shipped, Pittsmont		$521,128.25
Smelting operations adjustments, Pittsmont		$68,107.50
Other income, East Butte		$142,901.92
Gross income from operations		$732,137.67
Operating cost, Pittsmont		$560,334.14
Operating cost, East Butte		$155,111.82
Maintenance of properties, Pittsmont		$24,856.94
Maintenance of properties, East Butte		$6,130.89
Total cost of operations		$746,433.79

Loss on operations	$14,296.12
Depreciation copper inventory and deferred charges	$66,014.49
Depreciation on equipment	$1,787.39
Outside exploration	$7,756.42
Deficit from all operations	$89,854.42
Profit on Pittsmont operations transferred	$4,044.67
Deficit on East Butte operations	$93,899.09
Price per pound copper received—cents	14.005
Cost per pound copper delivered—do	14.359
Loss per pound copper—do	.354
Average price per ounce received for silver, Pittsmont mine—do	69.39
Average price per ounce received for silver, Silver Plume—do	70.06
Average price per pound received for lead, Silver Plume—do	7.72

The North Butte Mining Co. mined no ore during the year. Lessees produced 13,634 wet tons of ore, from which 1,601,985 pounds of refined copper was obtained. During the year this company purchased the properties of the Tuolumne Copper Co. This purchase was approved by the North Butte Mining Co. stockholders on December 29, 1925, and by the Tuolumne Copper Co. stockholders on February 24, 1926.

Copper, silver, and gold produced by North Butte Mining Co., 1918–1925

Year	Copper ore and precipitates treated	Copper	Silver	Gold	Dividends
	Short tons	*Pounds*	*Ounces*	*Ounces*	
1918	453,356	20,680,695	891,157	1,375	$430,000
1919	287,800	14,331,254	633,215	914	
1920	315,233	16,666,819	693,633	1,004	
1921	24,755	1,229,600	34,536	78	
1922	172,749	9,504,389	308,681	568	
1923	157,871	7,891,177	298,548	545	
1924 [1]	5,825	576,111	37,750	40	
1925 [1]	13,301	1,601,985	58,218	36	

[1] Operated by lessees in 1924 and 1925.

NEVADA

In 1925 Nevada produced 77,137,563 pounds of copper, 4.60 per cent of the total for the country, and ranked fifth among the copper-producing States. From the beginning of operations through 1925 Nevada has produced a total of 1,195,822,015 pounds, 3.34 per cent of the country's total, and also ranks fifth in total output. The mine production of copper in Nevada in 1925 was 79,300,224 pounds. Most of the copper produced in the State has come from the Ely (Robinson) district.

Ely (Robinson) district.—The mine production of copper in the Ely district amounted to 78,627,000 pounds, an increase from 73,279,000 pounds in 1924. Through 1925 this district has produced a total of 1,067,115,000 pounds and ranks eighth among the copper-producing districts of the country in total output. The Nevada Consolidated Copper Co. produces most of the output of the district and State.

Production of metals in Ely (Robinson) district, Nev., 1917–1925

[Mine figures]

Year	Ore	Copper produced	Average yield in copper	Gold and silver per ton of ore
	Short tons	*Pounds*	*Per cent*	*Cents*
1917	4,466,017	[1] 93,615,355	1.05	18
1918	4,519,445	[1] 92,396,638	1.02	24
1919	2,273,961	47,871,048	1.05	17
1920	2,589,546	48,347,828	.93	21
1921	400,810	10,282,527	1.28	25
1922	630,871	22,614,736	1.79	19
1923	2,833,674	65,928,279	1.16	24
1924	3,505,362	73,279,064	1.05	21
1925	3,922,770	78,627,308	1.00	21

[1] Smelter production.

After normal and regular charges for depreciation of plant and equipment were made the net earnings of the Nevada Consolidated Copper Co. that were credited to surplus during 1925 were $2,696,807.96, approximately $1.35 a share. Dividends were resumed during the last quarter of the year at the rate of 25 cents a share. During 1925 the ore reserves were recalculated, with the result that the estimated reserves at the end of the year were 84,584,114 tons, containing an average of 1.456 per cent copper. Of this quantity approximately 69,000,000 tons are in the Copper Flat area and 15,000,000 tons in the Ruth and Kimbley underground groups. This estimate is a large increase over the 57,225,060 tons given in the report for 1924, which was obtained by subtracting the ore mined during 1924 from the reserves previously reported. The former estimate did not include the ore in ore-bearing areas that were extended by development and for which no definite figures were available. Two additional ball mills were installed at the concentrator, bringing the total number to 24 at the end of 1925. The present superstructure will accomodate three more mills. The mill recovery showed a material increase, being 92.24 per cent in 1925, as compared with 87.09 per cent in 1924. The enlargements and improvements at the Nevada Consolidated Copper Co.'s properties are described by Parsons.[12]

Metals produced by Nevada Consolidated Copper Co., 1918–1925

Year	Ore treated	Average assay of copper	Average extraction of copper	Refined copper produced	Dividends
	Short tons	*Per cent*	*Per cent*	*Pounds*	
1918	3,999,526	1.506	67.28	76,607,062	$6,498,235
1919	2,135,425	1.599	70.49	43,971,892	2,999,186
1920	2,568,588	1.449	70.20	48,311,985	1,499,593
1921	392,645	1.49	75.23	9,362,325	----------
1922	518,523	1.60	75.19	23,762,675	----------
1923	2,576,388	1.31	82.90	61,573,246	----------
1924	3,418,900	1.198	87.09	70,237,050	----------
1925	[a] 3,234,390	[a] 1.21	92.24	73,653,886	499,864

[a] In addition, 598,114 dry tons of porphyry sulphide material, averaging 0.684 per cent copper, were concentrated, giving a recovery in electrolytic copper of 9.63 pounds to a ton milled.

[12] Parsons, A. B., "The rejuvenation of Nevada Consolidated": Eng. and Min. Jour.-Press, vol 120, Nov. 7, 1925, pp. 725–731.

The Consolidated Coppermines Corporation in 1925 produced 4,620,072 pounds of copper, 256.113 ounces of gold, 9,757.49 ounces of silver, 67,767 pounds of lead, and 203,439 pounds of zinc. Of this output 236,391 pounds of copper were obtained from leaching ore in place at the Morris Brooks mine.

Yerington district.—The mines, mill, and smelter of the Mason Valley Mines Co. were idle in 1925. They were being prepared for production, and the mill was ready in December, but the death of the general manager delayed the starting of the first unit until February 27, 1926. Custom ores were purchased and a large stock was accumulated at the smelter, which did not begin operations until August, 1926.

NEW MEXICO

From the beginning of operations to the end of 1925 New Mexico has produced 957,464,769 pounds of copper, 2.67 per cent of the country's total output of 35,802,060,557 pounds, and this State ranks sixth among those producing copper. In 1925 New Mexico produced 76,467,245 pounds of blister copper, 4.57 per cent of the country's total, and ranked sixth among the States. The Santa Rita district produces most of the copper from New Mexico, and the Chino mines of the Ray Consolidated Copper Co. furnish most of its output.

Central (including Santa Rita) district.—The Central district ranks ninth among the copper-producing districts in total production from the beginning of operations through 1925. The production for several years is given below:

Copper produced in Central (including Santa Rita) district, N. Mex., 1917–1925, in pounds

1917	82, 200, 000	1922	28, 408, 000
1918	77, 547, 000	1923	54, 375, 000
1919	40, 359, 000	1924	66, 824, 000
1920	44, 400, 000	1925	68, 812, 000
1921	9, 138, 000		

At the Chino mines of the Ray Consolidated Copper Co. power shovels removed 5,054,325 cubic yards of ore and waste, of which 3,281,334 cubic yards were stripping; the remainder was equivalent to 3,450,663 tons of ore. Of this ore 2,996,793 tons were shipped to the mill, 42,031 tons were shipped direct to the smelter, and 411,839 tons were added to the stock piles at Santa Rita. The estimated reserves of the Chino mines are 105,242,094 tons, containing an average of 1.44 per cent copper. Of these reserves approximately 75 per cent will be mined by shovel or other open-pit methods and 25 per cent by underground methods. Since operations began the Chino mines have produced 31,954,586 tons of ore. Five of the seven sections of the Hurley mill and the regrinding portion of the sixth section ran continuously in 1925. A total of 3,002,700 tons of ore was treated, equivalent to 8,226 tons a day, compared with 7,394 tons a day in 1924. The accompanying table gives the average grade of ore milled and the recovery obtained.

Metals produced by Chino mines of the Ray Consolidated Copper Co., N. Mex., 1918–1925

Year	Ore milled	Copper content	Mill recovery	Refined copper produced	Gold, silver, and miscellaneous income	Dividends
	Short tons	*Per cent*	*Per cent*	*Pounds*		
1918	3,836,400	1.63	63.275	75,655,641	$0.109	[1] $3,914,910
1919	1,765,200	1.82	65.67	40,488,706	.216	[2] 2,609,940
1920	1,838,140	1.76	70.67	44,051,849	.570	[3] 978,728
1921	361,660	1.70	77.36	9,137,282	.570	----------
1922	1,416,869	1.55	66.99	28,406,314	.90	----------
1923	2,785,564	1.50	66.34	54,261,228	.37	----------
1924	2,706,200	1.59	77.83	66,574,486	[4] .22	----------
1925	3,002,700	1.42	80.54	67,385,620	([5])	----------

[1] $1,087,475 represents distribution of capital.
[2] Total represents distribution of capital; no dividends paid during 1919.
[3] $652,485 represents distribution of capital.
[4] Computed for Ray and Chino mines together.
[5] Not given.

The recovery in 1925 showed a decided improvement on ores of lower grade. The average milling cost was 76.06 cents a ton in 1925, compared with 97.05 cents in 1924. This substantial decrease is due to the completion of mechanical improvements. In October, 1925, an average of 9,219 tons of ore was treated daily at a cost of 65.29 cents a ton.

Burro Mountain district.—The Burro Mountain branch of the Phelps Dodge Corporation continued to make small shipments of lease ore and of cement copper from the mine dump leaching operations. The company report states:

> A program of development and exploration at the Burro Mountain branch has served to materially increase the ore reserves and has presented possibilities of important extensions of previously known ore bodies and the discovery of higher grade material in a section of the property hitherto unexplored. The very extensive mineralized area in this property holds probabilities of the existence of important ore bodies as yet undetermined but the indications of which are becoming more defined with increasing knowledge of the geological formations.

Lordsburg district.—The Eighty-Five branch of the Calumet & Arizona Mining Co. produced 110,256 wet tons of ore in 1925, and lessees shipped 1,991 tons. The production of the Lordsburg district for several years is given in the following statement:

Copper produced in Lordsburg district, N. Mex., 1917–1925, in pounds

[Mine figures]

1917	4,262,000	1922	3,217,000
1918	2,215,000	1923	4,314,000
1919	3,516,000	1924	4,928,000
1920	2,696,000	1925	5,064,000
1921	579,000		

TENNESSEE

In 1925 Tennessee produced 19,789,234 pounds of blister copper, 1.18 per cent of the country's total, and ranked ninth among the copper-producing States. From the beginning of operations through 1925 Tennessee has produced approximately 469,542,000 pounds of

copper, 1.31 per cent of the total output for the country, and ranks ninth in total production also. Tennessee is the only eastern State that has made a notable output. The entire production comes from the Ducktown district, in Polk County, in the extreme southeastern part of the State.

Copper produced in Ducktown district, Tenn., 1918–1925

Year	Copper ore treated	Copper produced (smelter)	Average yield of copper	Gold and silver per ton of ore
	Short tons	*Pounds*	*Per cent*	*Cents*
1918	529,012	15,053,568	1.42	18
1919	555,018	15,629,454	1.41	21
1920	589,853	16,727,803	1.42	21
1921	564,457	15,084,294	1.34	18
1922	557,750	14,226,232	1.28	15
1923	776,477	18,721,932	1.21	12
1924	714,975	18,251,996	1.28	10
1925	794,930	19,789,234	1.24	10

The Burra Burra and London mines of the Tennessee Copper Co. were operated throughout the year, and beginning with June the Eureka mine was operated on a small tonnage. Improvements in metallurgy made it possible to mine and treat a large tonnage of lower-grade copper ore, and resulted in an increased output of copper. In 1925 the company produced 13,625,707 pounds of copper, compared with 12,726,635 pounds in 1924. There were 61,812 ounces of silver produced and 338 ounces of gold. The estimated reserves of copper ore for all mines are 5,752,297 tons, of which 3,551,114 tons are in the Burra Burra mine, 2,095,539 tons in the Eureka, 50,094 tons in the London, and 55,550 tons in the Polk County mine. The flotation plant treated 17 per cent more ore than in 1924, and the cost per ton was lower. The installation of a flotation unit for the recovery of iron from the tailings of the copper flotation plant was completed in June and satisfactory results are being obtained. Except for two short periods in the first half of the year, only one 32-foot furnace was in blast. The cost of smelting was lower in 1925 than in 1924. The sulphuric acid plant produced 329,394.73 tons of 60° acid.

Results at flotation plant of Tennessee Copper Co. in 1925

Ore milled (dry)	short tons	170,038
Average heads assay	per cent	1.43
Concentrate produced	short tons	21,886
Average concentrate assay	per cent	9.83
Ratio of concentration		7.8:1
Actual recovery	per cent	88.3
Cost per ton of ore milled		$0.756

Copper and sulphuric acid produced by Tennessee Copper Co., 1918–1925

Year	Ore treated	Copper	Sulphuric acid, 60° Baumé	Dividends
	Short tons	*Pounds*	*Short tons*	
1918	402,071	9,819,838	283,092	$392,817
1919	413,877	10,414,815	266,627	----------
1920	404,060	10,358,237	333,629	----------
1921	302,584	8,018,577	242,743	----------
1922	287,499	7,553,281	218,676	----------
1923	484,324	12,013,988	299,231	(1)
1924	451,777	[2] 12,566,576	247,477	(3)
1925	516,964	[4] 13,592,606	329,395	(5)

[1] Three quarterly dividends of 25 cents a share.
[2] Exclusive of 160,059 pounds of copper from other sources.
[3] A dividend of 25 cents was declared payable Jan. 15, 1924, to stockholders of record Dec. 31, 1923.
[4] Exclusive of 33,101 pounds of copper from other than Tennessee Copper Co. ore.
[5] Two dividends of 25 cents each were paid during the latter part of the year.

The properties of the other large copper producer in Tennessee, the Ducktown Sulphur, Copper & Iron Co., were taken over in November, 1925, by the Ducktown Chemical & Iron Co., an American company. The new company expected to produce iron sinter. The flotation plant and smelter were operated by the two companies, the operations of the Ducktown Chemical & Iron Co. supplementing those of the other company.

The Ocoee Copper Co. produced for the first time in 1925. Concentrates were shipped to the Tennessee Copper Co. and the Norfolk Smelting Co.

UTAH

The smelter production of copper in Utah dropped from 256,531,349 pounds in 1924 to 242,730,986 pounds in 1925. The 1925 production represented 14.49 per cent of the total output of the country and ranked Utah as the third largest copper-producing State in that year. From the beginning of operations through 1925 Utah has produced a total of 3,197,609,150 pounds of copper, 8.93 per cent of the total for the country, and ranks fourth among the copper-producing States in total production. Utah has, like nearly all of the important copper-producing States, one outstanding copper-producing district, the Bingham district. Among the six most important States in the output of copper, Arizona is the only one whose production is not made almost entirely in one district.

Bingham district.—The Bingham district was the second largest copper-producing district in the United States in 1925; only the Butte district, Montana, exceeded it. In total production from the beginning of operations the Bingham district ranks fourth with an output of 2,836,683,000 pounds. The outstanding producer in the Bingham district is the Utah Copper Co.

Copper produced in Bingham district, Utah, 1917–1925, in pounds

[Mine figures]

1917	225,412,000	1922	91,762,000
1918	211,195,000	1923	216,037,000
1919	116,697,000	1924	236,181,000
1920	110,670,000	1925	227,612,000
1921	28,011,000		

The mines of the Utah Copper Co. in 1925 produced and shipped to the mills 12,538,300 tons of ore, a daily average of 34,351 tons. This ore contained an average of 1.02 per cent copper. The Magna plant treated 6,662,100 tons of the ore and the Arthur plant 5,876,200 tons. During the year all mechanical shovels were equipped with caterpillar tractors, the work of changing from steam to electrically driven shovels proceeded, and at the end of the year 17 electric shovels were in use. The shovel operations of this company are described by Goodrich.[13] Regarding milling operations the company report says:

> During the second quarter of the year the standard mixture of flotation reagents used—namely, creosote oil in combination with sulphuric acid—was replaced at the Magna plant with a new combination of flotation reagents, sodium xanthate and lime. Shortly after this change the gravity concentrating apparatus was shut down, thereby saving the cost of operating this department without suffering any losses in metallurgy. Through the use of the new reagents, together with the saving of gravity concentration expense, a material reduction in milling cost is effected. As soon as stocks of oil and acid on hand were depleted the new combination of reagents was applied to the Arthur plant.

At the Arthur plant two additional ball mills were installed. The concentrates shipped to the smelter contained 222,978,209 pounds of copper. After allowance was made for losses in smelting and refining, the net production of refined copper was 214,162,139 pounds. The average cost of producing copper, after depreciation of plant and equipment and all fixed and general expenses were charged and credit given for gold, silver, and miscellaneous earnings, was 8.43 cents a pound, compared with 8.89 cents in 1924. Improvements made have resulted in increasing the output per man-shift at the mine from 11.04 tons in 1913 to 19.89 tons in 1925, and the output per man-shift at the mill from 16.60 tons in 1913 to 34.89 tons in 1925. A recalculation of the ore reserves, which took into account the lower grade material that has to be mined in order to make the higher grade ore available but can not be produced independently, showed 514,000,000 tons of milling ore, averaging 1.15 per cent copper. Four quarterly distributions totaling $4.25 a share were made during the year.

Metals produced by Utah Copper Co. from ore milled, 1918–1925

Year	Ore milled	Copper content	Mill recovery	Copper [a]	Gold and silver per pound of copper [b]	Dividends (includes capital distribution)
	Short tons	*Per cent*	*Per cent*	*Pounds*	*Cents*	
1918	12,160,700	1.226	65.11	188,092,405	0.79	$16,244,900
1919	5,538.700	1.26	78.46	105,088,740	.83	9,746,940
1920	5,556,800	1.16	81.38	101,897,758	.81	9,746,940
1921	1,220,700	1.16	83.87	24,511,593	[b] 1.15	4,061,225
1922	4,364,251	1.26	80.00	84,777,712	[b] 1.45	3,248,980
1923	11,167,800	1.12	80.96	195,142,919	[b] 1.313	6,497,960
1924	12,126,600	1.07	85.94	214,592,733	[b] 1.206	6,497,960
1925	12,538,300	1.02	86.96	214,162,139	[b] 1.36	6,904,083

[a] Net production of refined copper, not copper content of concentrates.
[b] Includes miscellaneous income 1921 to 1925. Comparative figure for 1920 is 2.09 cents.

[13] Goodrich, H. C., "Shovel operations at Bingham, Utah Copper Co.": Trans. Am. Inst. Min. and Met. Eng., vol. 72, 1925, pp. 566–587.

Cost of mining, milling, and concentrating copper ore by Utah Copper Co., 1918–1925

Year	Ore (short tons)	Cost per ton			
		Mining	Transportation	Milling	Total
1918	12,160,700	$0.5370	$0.2983	$0.9277	$1.7630
1919	5,538,700	.4900	.3040	1.2062	2.0002
1920	5,556,800	.4823	.2591	1.2472	1.9886
1921	1,220,700	.4998	.1921	1.1679	1.8598
1922	4,364,251	.3833	.1612	.8417	1.3862
1923	11,167,800	.3488	.1088	.6116	1.0692
1924	12,126,600	.3605	.1308	.5990	1.0903
1925	12,538,300	.3373	.1151	.5382	.9906

The copper production of the Ohio Copper Co., of Utah, decreased from 11,115,329 pounds in 1924 to 6,271,556 pounds in 1925. This reduction in output caused a corresponding increase in cost of production, from 5.815 cents a pound in 1924 to 8.3216 cents a pound in 1925. Apparently the condition of the water used for leaching purposes interfered with operations, and the company is making a study to overcome the trouble.

Copper production of the Ohio Copper Co., of Utah, in 1925

	Copper produced	Cost per pound	Price per pound	Profit per pound	Operating profits
	Pounds	*Cents*	*Cents*	*Cents*	
First quarter	1,632,772	7.9450	14.3400	6.3990	$104,416.92
Second quarter	1,509,438	8.4290	13.2740	4.8500	73,230.97
Third quarter	1,771,578	7.8040	14.2034	6.3994	113,374.48
Fourth quarter	1,357,768	9.3378	14.0986	4.7608	64,641.67
	6,271,556	8.3216	13.9926	5.6710	[1] 355,664.04

[1] After adding miscellaneous income and deducting taxes, insurance, and other miscellaneous charges, net profits were $231,318.57. After allowances for depreciation and depletion the balance transferred to surplus was $115,687.73.

Tintic district.—The Tintic district produced 4,627,000 pounds of copper in 1925, the largest output since 1918. From the beginning of operations through 1925 this district has yielded a total of 167,380,000 pounds of copper. The production for several years is shown as follows:

Copper produced in Tintic district, Utah, 1917–1925, in pounds

[Mine figures]

1917	9,118,000	1922	2,295,000
1918	6,569,000	1923	3,033,000
1919	3,251,000	1924	3,076,000
1920	3,003,000	1925	4,627,000
1921	1,570,000		

REFINERY PRODUCTION

The refinery output of copper in the United States in 1925 was made by 11 plants; 8 of these employed the electrolytic method and 3 employed the furnace process on Lake Superior copper. The Calumet & Hecla Consolidated Copper Co. usually employs both

methods, but the electrolytic plant has not been in commission since December, 1922, as the silver content of the copper is not enough to pay for its recovery.

Six of the large electrolytic refineries are on the Atlantic seaboard, and the three Lake refineries are on the Great Lakes; only two plants are west of the Great Lakes—one at Great Falls, Mont., and one at Tacoma, Wash. In addition to these refineries there are numerous plants in different parts of the country that make a considerable output from old copper, brass, and other alloys of copper. The output of the regular refining plants is in the form of casting, Lake, and electrolytic copper.

Refinery production from ores of domestic and foreign origin is shown in the table on page 400. The domestic figure is the one which is to be compared with smelter production from domestic sources, the main difference being the time factor explained in the introduction to this report, by which the figures for refinery production include copper that was mined some three months earlier than the beginning of the calendar year and smelted probably one or two months earlier.

CASTING AND PIG COPPER

Blister copper that is low in precious metals and free enough from impurities for certain uses is refined by the furnace process and ordinarily cast into ingots. This copper is usually unfit for uses requiring a high-grade copper, such as electric transmission, brass manufacture, and rolling, but is suitable for copper castings, and a large part of it is put to that use. Lake copper excepted, a comparatively small percentage of the copper output carries so small a content of precious metals that, together with the added value of electrolytic copper, it will not more than pay for the electrolytic refining of the copper; consequently the output of casting copper is small. Some blister or pig copper low in precious metals has been exported without further treatment and is probably consumed without electrolytic refining. Some of the districts produced a rather high grade of blister copper carrying a small amount of precious metals, and it is found profitable to market some of this copper without electrolytic refining. During 1925 the production of furnace-refined new casting copper amounted to 10,870,144 pounds. No unrefined pig and best select copper was reported as produced in 1925.

LAKE COPPER

Lake copper, as the term is used in this report, means the output of the Lake smelters. Ordinarily a considerable proportion of this output is refined electrolytically, but most of the electrolytically refined Lake copper is mixed with furnace-refined copper or is sold as some brand of Lake copper. Since December, 1922, however, the electrolytic plant of the Calumet & Hecla Consolidated Copper Co. has not been in commission because the silver content of the copper was not sufficient to pay for its recovery. The Quincy Mining Co. was the only company that reported having had any Lake copper electrolytically refined in 1925. The production of Lake copper in 1925 amounted to 138,029,764 pounds.

ELECTROLYTIC COPPER

In the table under the next heading all new copper that was refined electrolytically, except that from the Lake district that was sold as Lake copper, is included under electrolytic copper. In 1925 the production of electrolytic copper from primary materials of domestic origin amounted to approximately 1,533,995,000 pounds and from materials of foreign origin to 516,633,000 pounds, and in addition 140,350,000 pounds were produced from secondary sources—a total electrolytic production of 2,190,978,000 pounds for the year, compared with 2,180,604,000 pounds for 1924.

REFINED COPPER

The total output of new refined copper in 1925 was 2,204,574,000 pounds, a decrease of 55,502,000 pounds from that in 1924. Adding to the new refined copper produced from domestic and foreign sources the imports of refined copper gives the new copper made available for consumption during the year. In this table is shown also the production of secondary copper by the regular refineries but not the output of plants that treat only secondary material, which is shown in the table on page 401.

Primary and secondary copper produced by regular refining plants in the United States and imported, 1920–1925, in pounds

	1920	1921	1922	1923	1924	1925
Primary:						
Domestic [1]—						
Electrolytic	1,010,240,867	506,532,984	766,944,836	1,302,454,492	1,499,223,447	1,533,995,439
Lake	153,483,952	100,918,001	122,545,126	137,691,306	145,333,227	138,029,764
Casting	13,905,114	1,740,393	15,180,723	24,019,197	29,657,925	10,870,144
Pig and best select	4,793,307	222,878				
	1,182,423,240	609,414,256	904,670,685	1,464,164,995	1,674,214,599	1,682,895,347
Foreign [1]—						
Electrolytic	341,451,660	336,088,209	345,641,677	509,873,512	577,100,034	516,632,530
Casting and best select	2,290,446	5,275,350	5,203,597	5,797,109	8,761,377	5,045,947
Refinery production, new copper	1,526,165,346	950,777,815	1,255,515,959	1,979,835,616	2,260,076,010	2,204,573,824
Imports refined copper	108,743,298	69,249,281	103,143,142	[2] 160,711,227	145,909,968	99,773,546
Total new refined copper made available	1,634,908,644	1,020,027,096	1,358,659,101	2,140,546,843	2,405,985,978	2,304,347,370
Secondary:						
Electrolytic	32,856,549	82,017,382	100,792,685	85,297,052	104,281,430	140,349,541
Casting	49,130,510	24,467,951	45,217,857	46,141,409	50,536,678	58,010,653
	81,987,059	106,485,333	146,010,542	131,438,461	154,818,108	198,360,194
Grand total	1,716,895,703	1,126,512,429	1,504,669,643	2,271,985,304	2,560,804,086	2,502,707,564

[1] The separation of refined copper into metal of domestic and foreign origin is only approximate, as an accurate separation at this stage of manufacture is not possible.

[2] The figures of imports of refined copper from Chile in 1923 reported by the Chile Exploration Co. have been included in place of the figures of the Bureau of Foreign and Domestic Commerce for Chile, which undoubtedly are very low.

If the output of plants treating only secondary material is added to the production of the regular refining companies, the contribution from plants in the United States to the world's supply of copper for 1925 is found to be 3,045,000,000 pounds.

SECONDARY COPPER

Under secondary copper is considered material recovered from remelting old copper, copper scraps, and copper recovered from the treatment of copper alloys or alloys that are treated without the separation of the copper. A canvass of plants producing secondary copper has been made by J. P. Dunlop, of the Bureau of Mines, and the following figures are taken from his report:

Secondary copper recovered in the United States in 1925, with imports and exports of scrap brass and copper, in short tons

Copper as metal	183,700
Copper in alloys other than brass	66,900
	250,600
From new scrap (not including brass)	50,000
From old scrap (not including brass)	200,600
	250,600
Brass scrap remelted:	
New clean scrap	110,000
Old scrap	132,300
	242,300
Copper content of brass scrap (averaging about 70 per cent copper):	
New scrap	79,200
Old scrap	90,410
	169,610
Total copper produced from secondary sources (including copper content of brass scrap):	
From new scrap	129,200
From old scrap	291,010
	420,210
Imports of scrap brass	5,374
Imports of scrap copper	5,214
Exports of brass ingots, scrap, and old	48,189
Exports of scrap copper	6,053

85931°—28——26

Refined copper from secondary sources produced in the United States, 1916-1925, in pounds

1916	700, 000, 000	1921	434, 600, 000
1917	766, 800, 000	1922	671, 800, 000
1918	705, 340, 000	1923	821, 800, 000
1919	574, 380, 000	1924	776, 600, 000
1920	624, 920, 000	1925	840, 420, 000

COPPER SULPHATE

The production of hydrous copper sulphate or bluestone by the copper refineries of the United States in 1925 was 26,514,875 pounds, having a copper content of 6,754,000 pounds, as against 22,638,431 pounds, having a copper content of 5,766,000 pounds, in 1924.

STOCKS

Stocks of copper in the United States, January 1, 1919-1926, in pounds

Year	Refined copper	Blister and material in process of refining	Year	Refined copper	Blister and material in process of refining
1919	180, 000, 000	562, 600, 000	1923	216, 000, 000	361, 000, 000
1920	631, 000, 000	273, 000, 000	1924	264, 000, 000	432, 000, 000
1921	659, 000, 000	465, 000, 000	1925	243, 000, 000	393, 000, 000
1922	459, 000, 000	283, 000, 000	1926	124, 000, 000	432, 000, 000

IMPORTS AND EXPORTS

The imports of unmanufactured copper in 1925 amounted to 652,971,407 pounds, a decrease from the record figures of 768,813,731 pounds in 1924, but second only to the imports of 1923 and 1924. Large quantities of unrefined copper were imported from the Belgian Congo for refining in the United States, and also from Canada, Chile, Mexico, Peru, and Spain. From Chile the imports of this class of copper were less than half of those reported in 1924, and the only one of the countries mentioned that showed an increase was Mexico. Large quantities of ore and concentrates were received from Canada, Chile, Cuba, Mexico, and Spain. Imports of this class from Canada showed a large gain. The only important imports of refined copper were those received from Chile, which, however, were much smaller than in 1924. An increasing quantity of Chilean refined copper is being shipped direct to European countries, while virtually all of the ore and blister produced in Chile but not refined there is sent to the United States for treatment.

Copper (unmanufactured) imported into the United States, 1923–1925, in pounds

[General imports]

Country	Ore (copper content)	Concentrates (copper content)	Matte and regulus (copper content)	Unrefined black copper and copper in bars, pigs, or other forms	Refined in bars, plates, rods, or other forms	Old and clippings for remanufacture	Composition metal, copper chief value
1923							
Africa:							
British South	9,525	33,174					
Portuguese—							
East	64,908			17,187,927			
Other				53,031,418	380,120		
Australia	107,246			2,872,973			
Bolivia	62			2,151,357	163,229		
Canada	19,374,037	279,003	2,192,826	42,514,549	1,054,078	1,771,377	373,787
Chile	45,044,926	22,982		106,077,067	118,446,874	176,641	2,232,393
Cuba	9,735,954	13,666,280	5,060	1,645		737,748	12,135
France	336,978	6,097	33,500	2,813,867	3,786,859	34,026	
Germany	1,299,725		1,473	1,215,413		332,797	80,313
Mexico	2,319,922	34,362,617		82,161,843		65,470	
Peru	1,182,890	229,795		77,893,297	113,268	13,300	
Spain	7,494,217	482,688		4,160,761	2,905,493		
United Kingdom	102,398	200,485	46,563	556,959	1,617,790	1,904,531	1,492,817
Venezuela	1,450,886	351,254				220	
Other	1,629,029	306,380	681,427	2,624,208	246	449,239	1,996
Total value	90,152,703	49,940,755	2,960,849	395,263,284	128,467,957	5,485,349	4,202,441
	$11,735,291	$6,861,987	$408,666	$56,563,515	$19,119,537	$606,485	$599,993
1924							
Africa:							
British South				672,560			
Portuguese—							
East	70,378			34,330,735			
Other				90,487,936			
Australia				1,234,050			
Bolivia	262,167						
Canada	27,350,280	1,396,411	35,468	51,121,265	1,109,769	2,328,947	150,161
Chile	46,584,230	1,352,352	145,030	124,283,121	141,247,852	35,840	
Cuba	11,969,920	11,429,580				521,909	
France	592,511	6,048	13,642	3,376,036	633,645	9,588	1,312
Germany		37,318	21,159	44,990	17,200	59,043	14,862
Mexico	2,987,404	22,687,382	48,500	69,963,716	477,252	10,317	
Peru	1,731,222	46,185	13,222	74,951,579		5,946	
Spain	10,312,123	284,785		16,505,918			
United Kingdom	155,647	922,254	497,101	2,812,324	2,409,884	128,373	21,180
Venezuela		1,908,480					
Other	3,150,336	1,666,461	279,356	1,244,604	14,366	609,107	21,392
Total value	105,166,218	41,737,256	1,053,478	471,028,834	145,909,968	3,709,070	208,907
	$12,807,225	$4,693,029	$125,288	$59,462,150	$18,556,174	$402,260	$43,170
1925							
Africa:							
British South	65,055	38,950					
Portuguese—							
East	383,444	39,897		92,769,600			
Other		10,785					
Australia	900		227,231	224,415			
Canada	41,571,234	2,449,488	96,548	50,500,684	10,110	5,680,470	10,012
Chile	44,554,953	215,560	265,955	59,800,141	96,170,761	285,823	
Cuba	5,985,806	25,176,103				2,091,015	57,549
France	229,939	472,400	87,448	100,439			
Germany	70,810	128,312		1,160	24,640	1,391,205	241
Mexico	2,220,156	24,771,676	80,000	71,777,809		104,454	20,430
Peru	593,071	82,582	178,750	72,324,746		1,129	
Spain	8,897,949			14,419,651			
United Kingdom	407,187	107,626	32,259	3,898,193	22,460	520,741	112
Venezuela				1,068,971			4,732
Other	2,661,832	460,243	764,797	12,447,691	3,545,575	353,629	13,873
Total value	107,642,336	53,953,622	1,732,988	379,333,500	99,773,546	14,428,466	106,949
	$13,582,361	$6,491,514	$212,725	$48,870,358	$13,831,407	$1,188,711	$12,086

Copper (unmanufactured) imported into the United States, 1918–1925, in pounds

[General imports]

1918	575, 805, 115	1922	541, 013, 220
1919	429, 387, 594	1923	676, 473, 338
1920	485, 670, 691	1924	768, 813, 731
1921	350, 472, 611	1925	652, 971, 407

In 1925 the United States exported more copper to Germany than to any other country. The United Kingdom ranked second, France third, and Italy fourth. In 1924 the United Kingdom stood first, Germany second, France third, and Italy fourth. Exports of metallic copper declined in 1925, but because of the larger decline in imports more copper was drawn from domestic production for export than in 1924.

Copper exported from the United States, 1918–1925

Year	Pounds		Total value
	Metallic [1]	Total	
1918	744, 243, 481	747, 689, 580	$195, 840, 637
1919	515, 595, 019	516, 627, 775	117, 417, 055
1920	623, 158, 489	624, 053, 701	127, 468, 606
1921	628, 415, 714	628, 804, 750	85, 351, 928
1922	742, 755, 957	743, 039, 888	103, 874, 007
1923	828, 854, 827	829, 314, 002	129, 219, 975
1924	1, 116, 775, 136	1, 116, 915, 484	156, 645, 684
1925	1, 082, 369, 439	1, 084, 208, 532	161, 165, 820

[1] Exclusive of ore, concentrates, and composition metal, and in 1923, 1924, and 1925 of unrefined copper, figures for which are not separable from those for ore and concentrates.

Copper exported from the United States, 1924–25, in pounds

Country	Ore, concentrates, and unrefined copper (copper content)	Composition metal, copper chief value	Refined, in bars, ingots, or other forms	Old and scrap	Pipes and tubes	Plates and sheets	Wire (except insulated)	Insulated wire and cable	Rods	Other manufactures of copper
1924										
Belgium			76,954,752	64,548		67,262	234,532	70	1,042,089	334
Canada	15,467	39,247	30,946,501	2,031,679	1,109,166	1,545,578	341,949	997,006	10,296,685	1,634,683
China		199	63,128,544	51,205	629	16,740	12,961	102,455		17,998
Denmark			2,612,117			2,320	355	25,224	4,481,629	7,168
France			195,504,959	429,084		465,852	116,660	86,127	1,231,739	792,646
Germany			206,846,136	1,004,009	150	209,832	2,070		728,268	33,882
India (British)			4,501,706		10	488,654	71,214	98,013		24,560
Italy			107,989,642	253,786		918,265		8,070	103,400	66,217
Japan		406	19,055,608	185,958	15,281	114,847	9,688	73,133	4,025	11,376
Netherlands			59,221,141	166,429	8,924	243,108	105	19,104	852,308	801
Norway			1,845,311		169	88,472	2,505	21,794	1,617,310	822
Spain			5,251,322				117,000	59,362	3,000	45,917
Sweden			28,031,537		25		1,533	3,252		2,420
Switzerland			1,538,794				1,269		89,600	25,286
United Kingdom	25,453		198,656,260	793,875	1,231	1,575,307	363,478	1,022,059	39,342,119	870,088
Other Europe			3,880,901			2,420	1,448	48,481	560,268	5,269
Other countries	14,625	44,951	3,659,761	213,479	1,514,231	1,033,993	8,466,774	12,907,308	2,264,982	1,160,738
	55,545	84,803	1,009,624,992	5,194,052	2,649,816	6,772,650	9,743,541	15,471,458	62,618,422	4,700,205
Total value	$8,569	$19,971	$138,298,411	$566,163	$672,451	$1,331,537	$1,701,656	$3,895,763	$8,965,352	$1,185,811
1925										
Belgium	78,710		90,950,918	55,683		572,357	14,090	6,242	717,060	1,099
Canada	249,309		24,300,632	4,066,687	1,340,360	1,631,351	1,962,493	1,406,713	7,431,159	1,654,410
China			12,133,124	505,476	1,513	41,937	13,442	1,129,137	143	19,821
Denmark			1,639,533			1,556	3,951	17,382	2,818,405	9,315
France	224,598		145,809,549	373,539	59	448,222	2,573	189,603	785,943	5,517
Germany	1,046,118		229,291,382	4,188,651		3,935,655	90,975	57,991	1,119,902	173,106
India (British)			3,644,858	223,818	4,394	1,643,612	57,923	82,557		39,806
Italy			126,472,202	398,772		656,791	370	17,336	280,469	23,833
Japan	1,604		8,493,760	5,688	1,978	7,548	12,319	48,163		4,354
Netherlands	237,547		92,279,396	220,282	4,412	1,546,956	3,620	24,273	313,992	6,671
Norway			1,829,841		2,243		89,885	70,519	1,602,075	1,950
Spain			7,077,977	349,956		280	43,797	217,056	63,011	19,182
Sweden			29,105,773			3,200	724	9,097	280,115	13,804
Switzerland			1,688,373	57,902			500	8,703		1,931
United Kingdom			183,752,066	1,151,127	12,625	414,523	92,790	1,079,650	34,254,775	142,082
Other	1,207		9,596,053	507,880	1,416,441	1,301,295	9,276,127	13,452,571	4,602,793	1,339,938
	1,839,093		968,065,437	12,105,461	2,784,025	12,205,283	11,665,579	17,816,993	54,269,842	3,456,819
Total value	$232,636		$140,220,827	$1,555,999	$697,057	$2,331,190	$2,094,108	$4,900,264	$8,098,281	$1,035,458

Copper sulphate (blue vitriol) exported from the United States, 1918–1925

Year	Pounds	Value	Year	Pounds	Value
1918	14,477,338	$1,395,946	1922	5,250,556	$256,432
1919	9,140,673	928,291	1923	2,290,905	130,213
1920	3,783,409	306,899	1924	2,988,039	142,625
1921	3,582,933	217,491	1925	6,139,344	285,870

Brass and bronze exported from the United States, 1924–25

	1924		1925	
	Pounds	Value	Pounds	Value
Scrap and old	58,588,467	$5,352,197	[1] 96,378,288	[1] $9,889,153
Ingots,[1] bars, rods, plates, and sheets	4,529,257	740,993	[1] 7,975,053	[1] 1,359,594
Pipes and tubes	2,058,016	488,215	2,823,427	725,898
Pipe fittings, valves, faucets, etc	2,897,303	1,617,364	3,705,831	2,036,881
Builders' hardware of brass or bronze	405,747	350,505	1,095,641	690,960
Wire of brass or bronze	883,831	289,147	1,182,172	400,201
Other brass manufactures	5,074,891	2,693,525	7,001,056	3,461,767
Other bronze manufactures	1,646,039	860,290		
	76,083,551	12,392,236	120,161,468	18,564,454

[1] Ingots included with "scrap and old" in 1925.

Unmanufactured brass exported from the United States, 1918–1925

[Ingots,[1] bars, rods, plates, and sheets]

Year	Pounds	Value	Year	Pounds	Value
1918	30,989,717	$9,522,934	1922	3,660,340	$635,449
1919	7,770,671	2,310,561	1923	3,465,739	703,503
1920	5,810,733	1,671,608	1924	4,529,257	740,993
1921	2,874,762	741,110	1925	[1] 7,975,053	[1] 1,359,594

[1] Exclusive of ingots in 1925; not separately classified.

CONSUMPTION

As calculated by the method shown in the following table, the quantity of new copper consumed in a year is actually the amount of new copper withdrawn from available supply on domestic account. This method of computation is not accurate, as figures on consumers' stocks are not available and can not be taken into account. In addition, much copper withdrawn on domestic account is later exported in manufactured forms. The domestic withdrawals in 1925 total 1,401,000,000 pounds; they were larger than those of 1924 and, except for those of 1916 and 1918, were the largest ever recorded.

New refined copper withdrawn from total year's supply on domestic account, 1919–1925, in pounds

	1919	1920	1921
Total supply of new copper	1,805,306,801	1,634,908,644	1,020,027,096
Stock at beginning of year	180,000,000	631,000,000	659,000,000
Total available supply	1,985,306,801	2,265,908,644	1,679,027,096
Copper exported [1]	439,835,229	553,070,086	609,038,352
Stock at end of year	631,000,000	659,000,000	459,000,000
	1,070,835,229	1,212,070,086	1,068,038,352
Withdrawn on domestic account	914,471,572	1,053,838,558	610,988,744

	1922	1923	1924	1925
Total supply of new copper	1,358,659,101	2,140,546,843	2,405,985,978	2,304,347,370
Stock at beginning of year	459,000,000	216,000,000	264,000,000	243,000,000
Total available supply	1,817,659,101	2,356,546,843	2,669,985,978	2,547,347,370
Copper exported [1]	705,025,268	[2] 792,073,512	[2] 1,072,243,414	[2] 1,022,335,279
Stock at end of year	216,000,000	264,000,000	243,000,000	124,000,000
	921,025,268	1,056,073,512	1,315,243,414	1,146,335,279
Withdrawn on domestic account	896,633,833	1,300,473,331	1,354,742,564	1,401,012,091

[1] Includes unrefined black blister and converter copper (bars, pigs, and other forms) and refined in ingots, bars, rods, or other forms.

[2] Exclusive of small quantity of unrefined black blister for which figures are not separable from those for ore and concentrates.

Adding the 840,420,000 pounds of secondary copper and copper in alloys produced during the year to the 1,401,000,000 pounds of new refined copper withdrawn on domestic account gives a total of about 2,241,420,000 pounds of new and old copper that was available for domestic consumption.

USES

There are no official data available showing the quantity of copper that entered the different industries.

The following table shows the copper cast in different forms in 1925. It will be noted that the total is not the same as the production of refined copper:

Copper cast in different forms in the United States in 1925

Form	Pounds	Percentage
Wire bars	1,445,000,000	61.31
Ingots	285,000,000	12.09
Cakes	266,000,000	11.29
Cathodes	248,000,000	10.52
Other forms	113,000,000	4.79
	2,357,000,000	100.00

PRICES

Reports to the Bureau of Mines from copper-selling agencies in the United States indicate that 2,634,000,000 pounds of copper were delivered to domestic and foreign purchasers in 1925 at an average price of 14.2 cents a pound, or 1.1 cents a pound more than the average price obtained in 1923. The average price for copper in 1925 is considerably below the average for the 20-year period ended in 1925. The bright features of the market are the many new uses being found for copper at present prices, the breaking of all records for consumption, and the lack of interest in substitutes.

Price per pound of copper, 1900–1925, in cents [14]

1900	16.6	1907	20.0	1914	13.3	1921	12.9
1901	16.7	1908	13.2	1915	17.5	1922	13.5
1902	12.2	1909	13.0	1916	24.6	1923	14.7
1903	13.7	1910	12.7	1917	27.3	1924	13.1
1904	12.8	1911	12.5	1918	24.7	1925	14.2
1905	15.6	1912	16.5	1919	18.6		
1906	19.3	1913	15.5	1920	18.4		

Average monthly prices at New York per pound of electrolytic copper, 1918–1925, in cents, as reported by the American Metal Market Co.

Month	1918	1919	1920	1921	1922	1923	1924	1925
January	23.50	20.05	19.02	12.85	13.60	14.66	12.59	14.79
February	23.50	16.91	18.61	12.79	12.97	15.50	12.85	14.54
March	23.50	15.01	18.36	12.23	12.84	16.96	13.65	14.17
April	23.50	15.40	18.54	12.54	12.71	16.81	13.36	13.45
May	23.50	16.00	18.28	12.83	13.29	15.63	12.93	13.50
June	23.50	17.65	17.97	12.76	13.71	14.88	12.49	13.47
July	25.89	21.71	18.61	12.35	13.90	14.59	12.57	14.07
August	26.00	22.22	18.44	11.76	13.96	14.05	13.31	14.57
September	26.00	21.95	18.04	12.10	13.88	13.60	13.08	14.46
October	26.00	21.50	16.30	12.75	13.80	12.81	13.04	14.42
November	26.00	19.96	14.39	13.16	13.79	12.89	13.70	14.48
December	25.28	18.48	13.48	13.67	14.22	12.98	14.32	13.96
Average	24.68	18.90	17.50	12.65	13.56	14.61	13.16	14.16

Average monthly quoted prices at New York per pound of electrolytic copper, 1918–1925, in cents, as reported by the Engineering and Mining Journal-Press

Month	1918	1919	1920	1921	1922	1923	1924	1925
January	23.50	[a]	18.918	12.597	13.465	14.510	12.401	14.709
February	23.50	16.763	18.569	12.556	12.864	15.355	12.708	14.463
March	23.50	14.856	18.331	11.976	12.567	16.832	13.515	14.004
April	23.50	15.246	18.660	12.438	12.573	16.663	13.206	13.252
May	23.50	15.864	18.484	12.742	13.111	15.440	12.772	13.347
June	23.50	17.610	18.065	12.697	13.575	14.663	12.327	13.399
July	25.904	21.604	18.576	12.170	13.654	14.321	12.390	13.946
August	26.00	22.319	18.346	11.634	13.723	13.822	13.221	14.490
September	26.00	21.755	18.144	11.948	13.748	13.323	12.917	14.376
October	26.00	21.534	15.934	12.673	13.632	12.574	12.933	14.300
November	26.00	19.758	14.257	13.035	13.598	12.727	13.635	14.353
December	[a]	18.295	13.138	13.555	14.074	12.823	14.260	13.866
Average	24.628	18.691	17.456	12.502	13.382	14.421	13.024	14.042

[a] No market.

[14] Weed, W. H., Copper Handbook, vol. 11, pp. 1339, 1343, for years 1900 to 1903. U. S. Geological Survey computations for electrolytic copper since 1904. For 1916 and later years average price all marketable grades.

GOLD, SILVER, COPPER, LEAD, AND ZINC IN UTAH

(MINE REPORT)

By V. C. Heikes

PRODUCTION

The output of gold, silver, copper, lead, and zinc from Utah mines in 1925 was valued at $82,701,394, an increase of $16,473,757 in comparison with 1924. There were 179 lode mines producing and no placers, compared with 136 lode mines and two placers in 1924. The output of ore and the quantity of all metals except copper increased considerably. Silver increased 4,022,997 ounces and $3,206,048; the value of gold increased $647,364. Copper decreased 5,651,625 pounds but increased in value $1,860,989. Lead increased from $18,712,870 to $26,680,275 and zinc from $1,206,541 to $3,998,492. Published dividends of 12 producers amounted to $12,326,758 in 1925, making a recorded total of $263,800,871 paid to stockholders since mining became profitable.

Mine production of gold, silver, copper, lead, and zinc in Utah in 1925

	Number of producers	Ore, tailings, etc.	Gold	Silver	Copper	Lead	Zinc	Total value
		Short tons		*Fine ounces*	*Pounds*	*Pounds*	*Pounds*	
1925	179	14,479,247	$3,675,516	21,276,689	236,486,540	306,669,824	52,611,732	$82,701,394
Increase or decrease from 1924	+41	+838,629	+647,364	+4,022,997	−5,651,625	+72,758,949	+34,049,560	+16,473,757
Total, 1864–1925[1]	------	----------	114,089,441	491,424,010	3,259,428,618	5,375,823,450	310,639,406	1,374,966,527

[1] The total by years to the end of 1917 appears in U. S. Geol. Survey Prof. Paper 111, 1920, p. 127.

Of the various kinds of ore mined in Utah in 1925 copper ore led in quantity, followed by lead-silver ore and lead-zinc ore. The total value of metals in the ores, tailings, slag, etc., was as follows: Dry gold ore, $74,090; dry gold and silver ore, $1,329,571; dry silver ore, $3,821,501; copper ore, $34,263,804; lead ore, $24,719,755; zinc ore, $12,352; copper-lead ore, $400; copper-lead-zinc ore, $32,319; and lead-zinc ore, $18,447,602. No placer output was reported in 1925.

Included in the total output of Utah in 1925 were: 330,006 tons of old tailings, one-third of which was concentrated and the remainder shipped to the smelter for fluxing material; 27,261 tons of low-grade ore for smelter flux from old waste dumps at mines; and 561 tons of slag and matte from old smelter dumps. In the table on page 417 these products, except the dump ore, are separated from crude ore.

Ore and metals produced in Utah in 1925, by sources

Source	Number of producers	Ore, tailings, etc.		Gold		Silver	
		Short tons	Per cent	Fine ounces	Per cent	Fine ounces	Per cent
Dry gold ore	8	8,087	0.06	2,411.08	1.36	21,895	0.10
Dry gold and silver ore	7	[1]119,337	.82	22,081.90	12.42	636,383	2.99
Dry silver ore	37	[2]261,606	1.81	9,776.84	5.50	3,776,246	17.75
Copper ore	25	[3]12,575,265	86.85	87,168.24	49.02	[4]959,790	4.51
Lead ore	133	[5]699,361	4.83	27,002.58	15.19	10,318,309	48.50
Zinc ore	3	324					
Copper-lead ore	1	13		.04		55	
Copper-lead-zinc ore	1	563		5.07		3,957	.02
Lead-zinc ore	29	[6]814,691	5.63	29,357.33	16.51	5,560,054	26.13
		14,479,247	100.00	177,803.08	100.00	21,276,689	100.00

Source	Copper		Lead		Zinc	
	Pounds	Per cent	Pounds	Per cent	Pounds	Per cent
Dry gold ore	51,621	0.02	19,819			
Dry gold and silver ore	2,520,393	1.07	845,423	0.28		
Dry silver ore	1,354,158	.57	9,268,864	3.02		
Copper ore	[7]223,484,426	94.50	701,063	.23		
Lead ore	5,874,744	2.49	185,821,166	60.60		
Zinc ore			18,400		141,452	0.27
Copper-lead ore	1,370		1,924			
Copper-lead-zinc ore	10,194		136,737	.05	212,159	.40
Lead-zinc ore	3,189,634	1.35	109,856,428	35.82	52,258,121	99.33
	236,486,540	100.00	306,669,824	100.00	52,611,732	100.00

[1] Includes 75,619 tons of tailings.
[2] Includes 102,546 tons of tailings, 476 tons of slag, and 54,378 tons of ore leached.
[3] Includes 4 tons of matte.
[4] Includes 12 ounces of silver saved from precipitates.
[5] Includes 133,841 tons of tailings and 81 tons of slag.
[6] Includes 18,000 tons of tailings reconcentrated.
[7] Includes 7,359,866 pounds of copper saved from precipitates.

The metals recovered from gold ore were valued at $74,090, an average of $9.16 a ton. The ore yielded on the average 0.298 ounce of gold and 2.71 ounces of silver to the ton and 0.32 per cent of copper and 0.12 per cent of lead. More than 96 per cent of the gold ore was mined on the Juab County side of the Tintic district.

Dry gold ore sold or treated in Utah in 1925, with content in terms of recovered metals

County	Ore	Gold	Silver	Copper	Lead
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*
Box Elder	12	8.97	4		
Garfield	7	9.00	1		
Juab	7,815	1,559.10	21,202	48,660	19,808
Piute	1	.77			
Salt Lake	167	164.94	612	2,961	11
Tooele	85	668.30	76		
	8,087	2,411.08	21,895	51,621	19,819

Seven producers, compared with two in 1924, reported an output of siliceous gold and silver ore and old tailings which yielded on the average 0.185 ounce of gold and 5.33 ounces of silver to the ton and

1.06 per cent of copper and 0.35 per cent of lead. Mines in the Tintic district in Juab County produced more than 98 per cent of the gold and silver ore and tailings.

Dry gold and silver ore and old tailings sold or treated in Utah in 1925, with content in terms of recovered metals

County	Ore and tailings	Gold	Silver	Copper	Lead
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*
Beaver	102	16.08	712	407	
Juab	[1] 117,828	21,296.94	616,438	2,485,482	809,488
Piute	522	637.61	13,146	1,728	35,935
Salt Lake	885	131.27	6,087	32,776	
	119,337	22,081.90	636,383	2,520,393	845,423

[1] Includes 75,619 tons of old tailings.

Dry and siliceous silver ore, old tailings, and slag were reported by 37 producers in 1925, against 31 producers in 1924. This ore, tailings, and slag yielded on the average $0.77 in gold, 14.43 ounces of silver, 5.18 pounds of copper, and 35.43 pounds of lead to the ton. The Tintic district, in Juab and Utah Counties, had the greatest number of silver ore producers, 18. They reported 155,175 dry tons. One of these producers shipped to a chloridizing-roasting plant at Harold. The largest producers of silver ore and tailings were the Tintic Standard mine at Dividend, the Horn Silver mine at Frisco, the Park-Utah mine at Park City, and the Bullion Beck & Champion mine in the Tintic district.

Dry silver ore, old tailings, etc., sold or treated in Utah in 1925, with content in terms of recovered metals

County	Ore, old tailings, etc.	Gold	Silver	Copper	Lead
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*
Beaver	[1] 50,930	1,401.66	239,077	232,065	3,254,147
Box Elder	171	46.83	11,463	696	3,394
Juab	[2] 89,848	4,502.27	1,218,098	600,332	2,084,032
Salt Lake	[3] 6,116	616.91	65,369	20,357	104,372
Summit	[4] 13,457	399.73	85,222	95,954	718,498
Tooele	[5] 1,563	5.93	5,884	34,255	13,249
Utah	[6] 65,486	557.45	1,389,961	300,067	2,714,184
Wasatch	34,035	2,246.06	761,172	70,432	376,988
	261,606	9,776.84	3,776,246	1,354,158	9,268,864

[1] Consists of 50,545 tons of old tailings and 385 tons of slag.
[2] Includes 38,544 tons of tailings.
[3] Includes 1 ton of slag.
[4] Consists of tailings.
[5] Includes 32 tons of slag.
[6] Includes 58 tons of slag and 54,378 tons of ore leached.

Copper ore (with which is included a small quantity of matte) represented 87 per cent of the total ore output of the State. This ore yielded on the average 0.007 ounce of gold, 0.08 ounce of silver, and 17.77 pounds of copper to the ton, and the average value in metals was $2.72. Salt Lake County was credited with the largest output, chiefly from the Utah Copper property at Bingham.

Copper ore and matte sold or treated in Utah in 1925, with content in terms of recovered metals

County	Ore and matte	Gold	Silver	Copper	Lead
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*
Box Elder	61		12	7,367	
Davis	4	1.52		258	
Juab	1,030	166.90	12,969	141,779	9,308
Salt Lake	[1]12,571,158	83,794.91	[2]928,749	[2]223,090,468	688,350
Tooele	153	2.70	3,370	11,836	3,405
Uintah	1		4	743	
Utah	2,857	3,202.21	14,686	231,092	
Washington	1			883	
	12,575,265	87,168.24	959,790	223,484,426	701,063

[1] Includes 4 tons of matte.
[2] Includes 12 ounces of silver and 7,359,866 pounds of copper saved from precipitates.

The small quantity of copper-lead ore yielded on the average 0.003 ounce of gold and 4.23 ounces of silver to the ton and 5.27 per cent of copper and 7.40 per cent of lead; the average value in metals was $30.85 a ton.

One mine produced 563 tons of copper-lead-zinc ore, which yielded on the average 0.009 ounce of gold and 7.03 ounces of silver to the ton, and 0.91 per cent of copper, 12.14 per cent of lead, and 18.84 per cent of zinc; the average value in metals was $57.40 a ton.

The metals recovered from lead ore, old tailings, and slag were valued at $24,719,755, an average of $35.35 a ton. The output was reported by 133 producers. The ore, tailings, and slag averaged 0.039 ounce of gold and 14.75 ounces of silver to the ton and 0.42 per cent of copper and 13.28 per cent of lead. In 1924 there were 105 producers of lead ore, with a value in metals of $22,113,979.

Lead ore, old tailings, etc., sold or treated in Utah in 1925, with content in terms of recovered metals

County	Ore, tailings, etc.	Gold	Silver	Copper	Lead
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*
Beaver	5,090	177.90	31,087	36,777	1,664,568
Box Elder	80	1.92	895	249	23,681
Iron	6		7	38	3,343
Juab	[1]181,361	8,474.14	3,717,973	707,362	43,266,493
Millard	73		140		18,938
Morgan	29		55		6,622
Piute	118	11.67	834	204	11,896
Salt Lake	[2]184,742	11,150.42	1,318,632	2,849,961	52,933,008
Summit	[3]172,245	2,611.72	2,078,719	865,135	31,296,218
Tooele	[4]67,017	1,003.10	486,775	960,098	12,408,959
Utah	80,902	3,296.99	2,473,041	347,899	41,713,787
Wasatch	7,681	274.55	209,987	106,464	2,466,228
Washington	17	.17	164	557	7,425
	699,361	27,002.58	10,318,309	5,874,744	185,821,166

[1] Includes 17,030 tons of tailings.
[2] Includes 81 tons of slag.
[3] Includes 109,960 tons of tailings.
[4] Includes 6,851 tons of tailings.

Nearly all the zinc was recovered from lead-zinc ore, 48 per cent of which came from the Bingham or West Mountain district and 50 per cent from the Park City region. Most of the ore from these

districts was concentrated at Midvale and International, where some custom ore was milled and preparations were under way for more extensive work. In 1925 several lots of lead-zinc ore were shipped to a zinc plant in Texas and to plants in the East. Zinc ore, which yielded on the average $38.12 in metals a ton, was mined by three producers in 1925. Most of it came from the Tintic district, Juab County.

Lead-zinc ore and old tailings sold or treated in Utah in 1925, with content in terms of recovered metals

County	Ore and tailings	Gold	Silver	Copper	Lead	Zinc
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*
Beaver	455	6.22	3,673	1,120	105,850	167,229
Juab	9,391	225.09	67,871	9,976	1,574,241	1,561,436
Salt Lake	390,932	17,490.61	1,370,174	1,831,559	60,998,045	26,355,731
Summit	[1]178,590	2,038.75	1,493,388	450,782	19,839,629	5,375,717
Tooele	6,127	71.69	16,784	19,294	723,807	933,361
Wasatch	229,196	9,524.97	2,608,164	876,903	26,614,856	17,864,647
	814,691	29,357.33	5,560,054	3,189,634	109,856,428	52,258,121

[1] Includes 18,000 tons of old tailings reconcentrated.

The following table gives the zinc ore, lead-zinc ore, and concentrates produced in 1925, also the average zinc content (assay) and the zinc recovered:

Zinc ore, lead-zinc ore, and concentrates (as marketed from Utah mines and mills) sold to smelters in 1925

Classification	County	Quantity (dry weight)	Gross zinc	Average assay of ore or concentrates	Recovered zinc
		Short tons	*Pounds*	*Per cent*	*Pounds*
Oxidized zinc ore	Juab, Millard, and Tooele.	324	176,816	27.29	141,452
Oxidized lead-zinc ore	Tooele	106	39,879	18.81	31,903
Sulphide lead-zinc ore	Juab	94	41,238	21.94	32,990
Zinc and lead-zinc concentrates	Beaver, Juab, Salt Lake, Summit, Tooele, and Wasatch.	62,553	61,528,197	49.18	52,193,228
		63,077	61,786,130	48.98	52,399,573

MINING AND METALLURGIC INDUSTRY

GENERAL FEATURES

The output of silver, lead, and zinc exceeded that of any year since metal was produced in Utah, and the output of gold was decidedly larger than that of 1924. The value of the copper exceeded that of any other metal produced in the State; the total quantity was slightly less than for 1924. Utah led all other States in the production of silver, ranked second in lead, and third in copper in 1925. In lead output it surpassed Idaho, which had held second place for many years.

Important advances in the differential flotation of complex lead-zinc ores greatly stimulated the mining industry in Utah. Ores that contained zinc and formerly were penalized for that metal found a ready market at milling plants connected with the smelters. By reason of the larger quantity of ore mined and the shipments of siliceous fluxing material (ore from waste dumps and tailings from old mills) the output for 1925 exceeded the total output of the previous year by 838,629 tons in quantity of ore and $16,473,757 in value of metals recovered.

Custom milling plants in Utah that were active in 1925, all using flotation or wet concentration, are situated at Midvale, International near Tooele, and Bauer near Stockton; they are operated, respectively, by the United States Smelting, Refining & Mining Co., International Smelting Co., and the Combined Metals Reduction Co. These plants in Utah handled over 1,400 tons of ore daily. An average of 6,500 tons of zinc concentrate of 50 per cent grade was shipped monthly from Utah during the year. The ores milled, though differing chemically and physically, pass through the same crushing and grinding equipment and through the same flotation machines and flow sheet; only slight changes are made in the chemicals and oils used. For a good summary of the plants employing differential flotation, together with details of operation and the reagents used, the reader is referred to a report by Fahrenwald.[1]

A list of milling plants in Utah [1a] and a discussion of the extent to which flotation oils and other reagents were used in mills in Utah and other States in 1925 [1b] are given in two reports issued by the Bureau of Mines.

At Midvale a new flotation mill of 750 tons capacity was expected to be completed early in 1926. The custom mill of the International Smelting Co. was increased in capacity from 800 tons to 1,200 tons of ore a day. At Bauer about 150 tons of ore from Nevada and Utah mines were treated daily by flotation concentration.

The dividends paid by 12 mining companies in Utah in 1925 amounted to $12,326,758, exclusive of $2,799,459 paid to common shareholders of the United States Smelting, Refining & Mining Co., which controls mines at Eureka and Bingham, as well as mines in other States and in Mexico. The companies that contributed to this total were the Utah Copper, Tintic Standard, Silver King Coalition, Utah-Apex, Park-Utah Consolidated, Park City Mining & Smelting, Chief Consolidated, Bingham Mines, Ohio Copper, Eagle & Blue Bell, Keystone, and Mammoth.

In Utah 21 milling plants were running in 1925. Of these 16 were concentration plants, 5 of which used tables followed by oil-flotation devices, 4 used ordinary table concentration, 5 used straight flotation, and 1 equipped for wet concentration by tables and flotation had an additional plant that treated a dried iron-zinc middling by electrostatic separation. This method of separation, used only at Midvale, will be replaced entirely by flotation in 1926. The

[1] Fahrenwald, A. W., Present Status of Differential Flotation: Repts. of Investigations, Bureau of Mines, Serial 2700, 1925.

[1a] Heikes, V. C., Reduction Mills in Utah in 1925: Information Circ. 6027, Bureau of Mines, 1927, 10 pp.

[1b] Varley, Thomas, Consumption of Reagents Used in Flotation, 1925: Repts. of Investigations, Bureau of Mines, Serial 2777, 1926, 10 pp.

chloridizing-roasting and leaching plant of the Tintic Standard Mining Co. was closed in November, 1925. At the Chief mine, in the Tintic district, volatilization of the metals was still in the experimental stage, but a large quantity of silver-lead ore was treated by flotation. At three properties copper was precipitated from mine water or from water that had leached ore in place.

The table that follows shows the different kinds of concentrates produced in Utah in 1925. These concentrates yielded 61 per cent of the gold, 34 per cent of the silver, 92 per cent of the copper, 40 per cent of the lead, and more than 99 per cent of the zinc. The corresponding percentages in 1924 were 67, 22, 92, 36, and 99.

Mine production of gold, silver, copper, lead, and zinc from Utah concentrates in 1925

BY COUNTIES

	Ore to concentrating mills	Concentrates	Gold	Silver	Copper	Lead	Zinc	Total value of metal
	Short tons	*Short tons*	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*	
Beaver	455	307	6.22	3,673	1,120	105,850	167,229	$24,754
Box Elder	90	30	14.58	4,673	382	370	----------	3,630
Juab	55,726	21,336	1,326.77	691,938	51,847	9,553,832	1,528,446	1,462,340
Salt Lake	12,929,532	751,870	95,664.40	2,140,726	215,278,565	61,035,023	26,355,731	41,345,862
Summit	[1]160,590	[2]40,263	2,078.66	1,514,370	463,987	20,142,367	5,375,717	3,320,769
Tooele	[3]38,983	[4]20,722	351.24	302,297	863,242	6,319,620	1,113,617	974,078
Wasatch	229,196	59,287	9,524.97	2,608,164	876,903	26,614,856	17,864,647	5,804,691
	13,414,572	893,815	108,966.84	7,265,841	217,536,046	123,771,918	52,405,387	52,936,124

BY KINDS OF CONCENTRATES

Dry and siliceous	30	14.58	4,673	382	370	----------	$3,630
Copper	638,000	78,158.14	769,746	213,446,624	----------	----------	32,459,297
Lead	192,854	27,985.78	6,023,349	3,924,453	119,873,813	----------	15,745,017
Zinc	62,718	2,797.92	463,961	155,128	3,755,689	52,333,600	4,705,953
Copper-lead	131	4.04	3,572	9,459	127,045	----------	14,959
Lead-zinc	82	6.38	540	----------	15,001	71,787	7,268

AVERAGE RECOVERABLE CONTENT

	Short tons	*Fine ounces per ton*	*Fine ounces per ton*	*Per cent*	*Per cent*	*Per cent*	*Value per ton*
Dry and siliceous	30	0.486	155.77	0.64	0.62	----------	$121.00
Copper	638,000	.122	1.21	16.73	----------	----------	50.88
Lead	192,854	.145	31.23	1.02	31.08	----------	81.64
Zinc	62,718	.044	7.40	.12	2.99	41.72	75.03
Copper-lead	131	.030	27.27	3.61	48.49	----------	114.19
Lead-zinc	82	.078	6.59	----------	9.15	43.77	88.63
	893,815	.121	8.13	12.17	6.92	2.93	59.22

[1] Also 126,850 tons of old tailings milled.
[2] Includes concentrates from 126,850 tons of old tailings.
[3] Also 6,851 tons of old tailings milled.
[4] Includes concentrates from 6,851 tons of old tailings.

The foregoing tables give the total concentrates, including those from old tailings, but a separation of the concentrates from old tailings alone follows:

Production of gold, silver, copper, lead, and zinc from Utah concentrates recovered from old tailings in 1925

BY COUNTIES

	Old tailings to concentrating mills	Concentrates	Gold	Silver	Copper	Lead	Zinc	Total value of metal
	Short tons	*Short tons*	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*	
Summit	126,850	1,201	51.09	25,521	17,289	382,483	----------	$54,498
Tooele	6,851	1,463	8.60	31,717	128,079	671,848	224,835	115,915
	133,701	2,664	59.69	57,238	145,368	1,054,331	224,835	170,413

BY KINDS OF CONCENTRATES

Lead	2,399	59.69	57,036	144,480	1,052,176	----------	$152,872
Zinc	265	----------	202	888	2,155	224,835	17,541

AVERAGE RECOVERABLE CONTENT

	Short tons	*Fine ounces per ton*	*Fine ounces per ton*	*Per cent*	*Per cent*	*Per cent*	*Value per ton*
Lead	2,399	0.025	23.77	3.01	21.93	----------	$63.72
Zinc	265	----------	.76	.17	.41	42.42	66.19
	2,664	.022	21.49	2.73	19.79	4.22	63.97

Crude ore of all kinds shipped directly to the smelters amounted to 5 per cent of the total output and yielded 32 per cent of the gold, 56 per cent of the silver, 4 per cent of the copper, 56 per cent of the lead, and less than 1 per cent of the zinc. The corresponding percentages in 1924 were 32, 71, 3, 62, and 1.

Mine production of gold, silver, copper, lead, and zinc from Utah crude ore shipped to smelters in 1925

BY COUNTIES

	Ore	Gold	Silver	Copper	Lead	Zinc	Total value of metal
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*	
Beaver	5,192	193.98	31,799	37,184	1,664,568	----------	$176,175
Box Elder	222	34.17	7,697	7,930	26,705	----------	9,497
Davis	4	1.52	----------	258	3,343	----------	359
Iron	6	----------	7	38	----------	----------	10
Juab	220,573	25,273.74	4,275,272	2,851,408	34,436,986	119,196	6,899,471
Millard	140	----------	140	----------	18,938	36,215	4,497
Morgan	29	----------	55	----------	6,622	----------	614
Piute	640	649.28	13,980	1,932	47,831	----------	27,559
Salt Lake	224,382	17,664.28	1,547,473	5,185,789	53,677,280	----------	6,845,404
Summit	62,285	2,551.31	2,052,772	848,975	30,880,080	----------	4,284,485
Tooele	29,693	1,405.43	214,514	173,418	6,968,461	50,934	812,678
Uintah	1	----------	4	743	----------	----------	109
Utah	94,809	7,038.65	2,889,950	658,231	42,103,513	----------	5,907,602
Wasatch	41,716	2,520.61	971,159	176,896	2,843,216	----------	998,569
Washington	18	.17	164	1,440	7,425	----------	968
	679,710	57,333.14	12,004,986	9,944,242	172,684,968	206,345	25,967,997

Mine production of gold, silver, copper, lead, and zinc from Utah crude ore shipped to smelters in 1925—Continued

BY KINDS OF ORE

	Ore	Gold	Silver	Copper	Lead	Zinc	Total value of metal
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*	
Dry and siliceous	155,901	23,177.08	2,554,239	2,372,869	2,060,389		$2,767,956
Copper	36,961	9,009.65	189,989	2,677,687	700,812		759,299
Lead	486,311	25,146.37	9,260,703	4,892,316	169,878,343		22,420,874
Zinc	324				18,400	141,452	12,351
Copper-lead	13	.04	55	1,370	1,924		401
Lead-zinc	200				25,100	64,893	7,116

AVERAGE RECOVERABLE CONTENT

	Short tons	*Fine ounces per ton*	*Fine ounces per ton*	*Per cent*	*Per cent*	*Per cent*	*Value per ton*
Dry and siliceous	155,901	0.148	16.38	0.76	0.66		$17.75
Copper:							
Oxidized	10,014	.161	3.29	3.74	.03		16.28
Sulphide	26,947	.274	5.83	3.58	1.29		22.13
Lead:							
Oxidized	126,675	.054	20.85	.30	14.68		42.01
Sulphide	359,636	.150	18.41	.57	18.45		47.55
Zinc:							
Oxidized	324				2.84	21.83	38.12
Copper-lead:							
Oxidized	13	.003	4.23	5.27	7.40		30.85
Lead-zinc:							
Oxidized	106				5.42	15.05	32.32
Sulphide	94				7.23	17.55	39.25
	679,710	.084	17.66	.73	12.70	.01	38.20

Production of gold, silver, copper, and lead in 1925 from Utah material other than crude ore and concentrates smelted and ore treated by amalgamation or cyanidation

BY COUNTIES

	Material	Gold	Silver	Copper	Lead	Total value of metal
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	
Beaver	50,930	1,401.66	239,077	232,065	3,254,147	$510,958
Juab	131,193	9,623.93	687,341	1,090,336	3,790,952	1,160,600
Salt Lake	86	20.38	1,424	7,363,728	11,483	1,048,057
Summit	14,567	420.23	90,187	98,909	831,898	157,697
Tooele	32	.16	90	387		122
Utah	54,436	18.00	987,738	220,827	2,324,458	919,448
	251,244	11,484.36	2,005,857	9,006,252	10,212,938	3,796,882

BY KINDS OF MATERIAL

Old tailings smelted	196,305	11,445.82	1,015,911	1,421,310	7,843,811	$1,825,886
Old smelter cleanings, slag, and matte resmelted	561	20.54	2,277	4,249	48,300	6,810
Ore leached by chloridizing roasting process	54,378	18.00	987,657	220,827	2,320,827	919,076
Precipitates from ore in place and mine water			12	7,359,866		1,045,110

AVERAGE RECOVERABLE CONTENT

	Short tons	*Fine ounces per ton*	*Fine ounces per ton*	*Per cent*	*Per cent*	*Value per ton*
Old tailings smelted	196,305	0.058	5.18	0.36	2.00	$9.30
Old smelter cleanings, slag, and matte resmelted	561	.037	4.06	.38	4.30	12.14
Ore leached by chloridizing roasting process	54,378		18.16	.20	2.13	16.90
	251,244	.046	7.98	1.79	2.03	15.11

GOLD

The mine production of gold increased 21 per cent. Most of the gold came from ores mined in Salt Lake, Juab, Wasatch, Utah, and Summit Counties, here named in order of output. The gain was particularly noticeable in Juab and Salt Lake Counties and was due to the increased output of lead-zinc ore.

In Utah gold is produced largely as a by-product in the smelting of copper, lead, and lead-zinc ores and concentrates. The Utah Copper property at Bingham was the largest producer of gold in 1925; the Chief Consolidated property, in the Tintic district, was second; and the Bingham property of the United States Smelting, Refining & Mining Co., Utah-Apex, Park-Utah, Mammoth tailing dump, Utah-Delaware, Silver King Coalition, Tintic Standard, and the American Fork property of the Yankee Mines Co. followed.

SILVER

In 1925 Utah was again the largest producer of silver in the United States, and the output was the largest ever made in the State, surpassing the record output of 1923 by 2,139,219 ounces. Juab County once more led in output, followed by Utah, Salt Lake, Summit, and Wasatch Counties. In these counties the increase was especially noticeable in the Tintic, Park City, and Bingham districts. The chloridizing-roasting process was in full operation until November at only one plant, where a rich precipitate was produced from which 987,657 ounces of silver were reported in 1925. Ten properties each produced more than 550,000 ounces of silver in 1925. The chief producers of silver were the Tintic Standard, in the Tintic district; the Park-Utah mines, in the Park City region; the Chief Consolidated mines, in the Tintic district; the Silver King Coalition and the Park City Mining & Smelting Co., in the Park City region; the Utah-Apex, the property of the United States Smelting, Refining & Mining Co., and the Utah Copper, at Bingham; the Victoria, in the Tintic district; and the Ontario, in the Park City region.

COPPER

In 1925 the largest quantity of copper came from ores mined in the Bingham or West Mountain district, Salt Lake County; the outputs of the Tintic district, Juab County, and the Park City region, Summit and Wasatch Counties, followed.

Crude ore shipped to smelters yielded 9,944,242 pounds of copper, against 6,721,178 pounds in 1924. Of the copper from crude copper ore smelted 1,928,608 pounds were from sulphide ores and 749,079 pounds from oxidized ores; of the lead ores smelted sulphide ores yielded 4,117,994 pounds of copper and oxidized ores 774,322 pounds. The dry and siliceous ore, used chiefly as a flux at smelting plants, yielded 2,372,869 pounds, against 1,650,358 pounds in 1924. The low-grade disseminated ores that were concentrated yielded 213,446,624 pounds of copper, against 221,255,726 pounds in 1924.

The leading copper producers were, in order of output, the Utah Copper Co. (which reported 214,162,139 net pounds), Ohio Copper, Utah-Apex, Chief Consolidated, Utah-Delaware, Silver King Coalition, and the Bingham property of the United States Smelting, Refin-

ing & Mining Co. The Ohio Copper Co., at Lark, continued to leach in place the caved area of the mine.

LEAD

In 1925 Utah ranked second among the States as a producer of lead. The output was the largest the State has ever made, mainly because of the better price for the metal and the higher recovery of lead from complex lead-zinc ores. Nearly every producing lead property worked at maximum capacity, as high prices made profitable the mining of considerable low-grade ore that had been of doubtful value.

The Bingham or West Mountain district produced 109,964,255 pounds of lead, compared with 69,571,834 pounds in 1924. The largest part of the output at Bingham came from the Utah-Apex mine and the property of the United States Smelting, Refining & Mining Co. The Park City region produced 81,312,417 pounds, against 66,692,730 pounds in 1924; the Tintic district produced 91,778,506 pounds, against 81,348,458 pounds; the combined production of the Ophir and Rush Valley districts, Tooele County, increased from 4,680,499 to 10,819,994 pounds; the output in Beaver County increased from 2,589,376 to 5,024,565 pounds; and the combined production of the Big and Little Cottonwood districts, Salt Lake County, decreased from 6,256,829 to 4,748,256 pounds.

The Utah-Apex property at Bingham was first in lead output It was followed in order by the Tintic Standard, in the Tintic district; the Silver King Coalition, in the Park City region; the property of the United States Smelting, Refining & Mining Co., at Bingham; the Park City Mining & Smelting Co., at Park City; the Chief Consolidated properties, in the Tintic district; and the Utah-Delaware mine, at Bingham. Each of these was credited with producing more than 17,000,000 pounds of lead. Next in rank were the Park–Utah, Keystone, Dalton & Lark, Ophir Hill, Victoria, Eagle & Blue Bell, Horn Silver, and Plutus mines.

ZINC

The mine production of zinc for 1925 was nearly three times that for 1924, and was a record for the State. This remarkable showing was due to the better recovery of metal from complex lead-zinc ores. Custom milling plants paid for zinc in ores, reversing the practice of the lead-smelting plants in penalizing the metal. Zinc in crude ores and concentrate smelted, if it exceeds 10 per cent, continues to be penalized at lead plants because of the high cost of smelting such ore.

The mines of the United States Smelting, Refining & Mining Co., at Bingham, were first in zinc output. They were followed in order by the Park-Utah and Park City Mining & Smelting Co., in the Park City region, and the Utah-Delaware, at Bingham. The Utah-Apex and Silver King Coalition companies not only shipped zinc material for milling but made a first-class zinc concentrate at their own mills. Other zinc producers were the Bullion Coalition, Ontario, Chief Consolidated, Keystone (Park City), Utah Metal & Tunnel, Bingham Mines, Horn Silver, Godiva, Mammoth, New Bullion, and Scranton mines. Noteworthy increases in zinc recovered from the ores of both Park City and Bingham were due in large part to the

successful operation of the custom flotation plant at International, where mixed ores yielded a lead concentrate that was smelted locally and a zinc concentrate that was shipped to Great Falls, Mont. The United States Smelting, Refining & Mining Co., at Midvale, operated its wet mill and electrostatic plant and also a small pilot flotation plant while the 750-ton flotation mill was under construction. At Bauer the Combined Metals Reduction Co. treated zinc-lead ores that came from Nevada but partly from the Bullion Coalition property near Stockton, Utah.

REVIEW BY COUNTIES AND DISTRICTS

Mine production of gold, silver, copper, lead, and zinc in Utah in 1925, by counties

County	Ore, tailings, etc. (short tons)	Gold		Silver	
		Fine ounces	Value	Fine ounces	Value
Beaver	56,577	1,601.84	$33,113	274,549	$190,537
Box Elder	324	57.71	1,193	12,374	8,588
Davis	4	1.50	31		
Garfield	7	9.00	186	1	1
Iron	6			7	5
Juab	407,492	36,224.46	748,826	5,654,551	3,924,258
Millard	140			140	97
Morgan	29			55	38
Piute	641	650.06	13,438	13,980	9,702
Salt Lake	13,154,000	113,349.06	2,343,133	3,689,623	2,560,598
Summit	364,292	5,050.20	104,397	3,657,329	2,538,186
Tooele	75,559	1,756.83	36,317	516,901	358,729
Uintah	1			4	3
Utah	149,245	7,056.66	145,874	3,877,688	2,691,116
Wasatch	270,912	12,045.57	249,004	3,579,323	2,484,050
Washington	18	.19	4	164	114
Total, 1924	14,479,247	177,803.08	3,675,516	21,276,689	14,766,022
	13,640,618	146,486.85	3,028,152	17,253,692	11,559,974

County	Copper		Lead		Zinc		Total value
	Pounds	Value	Pounds	Value	Pounds	Value	
Beaver	270,369	$38,392	5,024,565	$437,137	167,229	$12,709	$711,888
Box Elder	8,312	1,180	27,075	2,356			13,317
Davis	258	37					68
Garfield							187
Iron	38	5	3,343	291			301
Juab	3,993,591	567,090	47,781,770	4,157,014	1,647,642	125,221	9,522,409
Millard			18,938	1,648	36,215	2,752	4,497
Morgan			6,622	576			614
Piute	1,932	274	47,831	4,161			27,575
Salt Lake	227,828,082	32,351,588	114,723,786	9,980,969	26,355,731	2,003,036	49,239,324
Summit	1,411,871	200,486	51,854,345	4,511,328	5,375,717	408,555	7,762,952
Tooele	1,037,047	147,261	13,288,081	1,156,063	1,164,551	88,506	1,786,876
Uintah	743	106					109
Utah	879,058	124,826	44,427,971	3,865,234			6,827,050
Wasatch	1,053,799	149,639	29,458,072	2,562,852	17,864,647	1,357,713	6,803,258
Washington	1,440	205	7,425	646			969
Total, 1924	236,486,540	33,581,089	306,669,824	26,680,275	52,611,732	3,998,492	82,701,394
	242,138,165	31,720,100	233,910,875	18,712,870	18,562,172	1,206,541	66,227,637

Ore, tailings, etc., sold or treated, number of lode mines producing, and average value of ore, tailings, etc., in Utah, 1924–25, by counties

County	Ore, tailings, etc., sold or treated in 1925 (short tons)		Number of lode mines producing		Average total value per ton		Average value per ton in gold and silver	
	Total	Increase or decrease	1924	1925	1924	1925	1924	1925
Beaver	56,577	+42,290	8	6	$21.17	$12.58	$5.93	$3.95
Box Elder	324	+254	3	5	24.96	41.10	9.79	30.19
Davis	4	+4	-------	1	-------	17.00	-------	7.75
Garfield	7	+3	1	1	16.00	26.71	16.00	26.71
Iron	6	−17	1	1	40.91	50.17	.74	.83
Juab	407,492	+175,191	26	30	28.05	23.37	14.55	11.47
Millard	140	+140	-------	1	-------	32.12	-------	.69
Morgan	29	+29	-------	1	-------	21.17	-------	1.31
Piute	641	+495	2	3	59.04	43.02	55.73	36.10
Salt Lake	13,154,000	+428,719	36	49	3.29	3.74	.32	.37
San Juan	-------	−32	1	-------	17.72	-------	17.72	------
Summit	364,292	+91,023	8	14	24.70	21.31	8.58	7.25
Tooele	75,559	−15,326	29	46	9.06	23.65	2.64	5.23
Uintah	1	+1	-------	1	-------	109.00	-------	3.00
Utah	149,245	−16,552	16	15	40.04	45.74	16.74	19.01
Wasatch	270,912	+132,389	5	4	23.98	25.11	12.10	10.09
Washington	18	+18	-------	1	-------	53.83	-------	6.56
	14,479,247	+838,629	136	179	4.85	5.71	1.07	1.27

BEAVER COUNTY

Both the quantity and the value of the metals in ore mined in Beaver County were larger than in 1924. There were six producers, two less than in 1924. The output of ore, old tailings, and slag increased from 14,287 in 1924 to 56,577 tons in 1925, gold from $13,914 to $33,113, silver from 105,671 to 274,549 fine ounces, copper from 61,308 to 270,369 pounds, lead from 2,589,376 to 5,024,565 pounds, zinc from 40,201 to 167,229 pounds, and the total value from $302,508 to $711,888.

Preuss district.—Lead ore containing silver was shipped from the Galena property.

San Francisco district (Frisco, Newhouse).—The Horn Silver was the only producing mine in the San Francisco district in 1925. It was worked by lessees who shipped ore and also old tailing. The concentration mill on the property was idle. Ores of milling grade were shipped to mills at Midvale and International and yielded both lead and zinc concentrates. A large part of the output consisted of old tailing, containing lead and a little copper, and a considerable part of the lead was saved at a copper plant.

Star and North Star district.—Four producers in the Star district reported 3,053 tons of ore yielding $1,083 in gold, 12,654 ounces of silver, 8,204 pounds of copper, and 1,022,909 pounds of lead, valued in all at $100,023, or $32.76 a ton. Most of the ore was from the Moscow property. This ore assayed 2 to 11 ounces of silver and 20 cents in gold to the ton, 13 to 38 per cent of lead, 1.5 to 4 per cent of sulphur, and an average of about 30 per cent of iron. Drifting on the 1,400-foot level of the Moscow property was done to cut the downward extension of the ore found between the 900 and 1,100 foot levels. Milford is the shipping point, and the freight rate to Salt Lake City averaged about $3 a ton, varying with the grade of the ore.

From the Wild Bill mine, which is opened by a 700-foot inclined shaft, 1,016 tons of ore, yielding 2,849 ounces of silver, 2,489 pounds of copper, and 245,196 pounds of lead, were shipped to a smelter. The Maud S. claim was worked by a lessee, who shipped about 100 tons of lead-silver ore containing an average of 26 per cent of lead, 48 ounces of silver, and $8 in gold to the ton.

BOX ELDER COUNTY

Ashbrook district.—Ore mined in the Ashbrook district is hauled to Oakley, Idaho, a station on the Oregon Short Line Railroad. A lessee shipped ore and concentrate from the Vipont Silver mine, and some silver ore containing a little lead and gold was produced from the Skoro property. In the Skoro mine, which is opened by a tunnel 900 feet long, approximately 200 feet of development was done in 1925.

Lucin district.—Lessees at the Copper Mountain property, near Lucin, produced lead sulphide ore containing silver.

Promontory district.—A prospector reported the shipment of 12 tons of lead ore from Promontory Point, on the Southern Pacific Railroad, 25 miles west of Ogden.

DAVIS COUNTY

Farmington district.—The Crawford Exploration Co. worked the Free Gold group of claims lying on the north side of Farmington Canyon, one-half mile north of the canyon between Mud Creek and Whipple Creek. These claims were located in the early nineties and at present are inaccessible by wagon because of bad roads. The ore shipped averaged $8 in gold and 0.10 ounce of silver to the ton, 3.65 per cent of copper, 5.4 per cent of iron, and 80 per cent of insoluble.

GARFIELD COUNTY

Imperial district.—A small lot of siliceous gold ore from the Rico claim was milled in an arrastre.

IRON COUNTY

Calumet district.—A small lot of lead ore was shipped from the property of the Coin Silver Mines Co.

JUAB COUNTY

Detroit district.—A lessee operating the property of the Ibex Gold Mining Co. made two shipments of copper ore that carried a small percentage of bismuth, for which the smelter also made payment.

Fish Springs district.—The Emma, Galena, and Utah mines have been idle for some time, but lessees shipped small lots of lead ore sorted from the mine dumps.

Mount Nebo district.—The Nebo Star property, operated by a lessee, yielded less than a ton of lead ore, which with lead ore from two other claims in the vicinity amounted to an output of 27 tons.

Spring Creek district.—Some silver ore was mined by the Crawford Exploration Co., working the Boston and Premier Silver properties.

The ore was hauled to the nearest loading station at Gold Hill on the Deep Creek branch of the Western Pacific Railroad, 30 miles from the mine.

Tintic district.—A number of important mines in the eastern part of the Tintic district lie in Utah County, but they are mentioned in this review of Juab County, and their output is included in the following tables:

Mine production of gold, silver, copper, lead, and zinc in Tintic district, Utah, in 1925, by counties

	Number of producers	Ore and tailings	Gold	Silver	Copper	Lead	Zinc	Total value
		Short tons		*Fine ounces*	*Pounds*	*Pounds*	*Pounds*	
Juab	21	407,324	$748,393	5,649,607	3,982,280	47,724,623	1,647,642	$9,511,967
Utah	7	145,829	79,635	3,849,818	644,502	44,053,883	----------	6,675,616
	28	[1]553,153	828,028	9,499,425	4,626,782	91,778,506	1,647,642	16,187,583
Increase from 1924	3	158,409	236,623	1,244,908	1,550,441	10,430,048	1,490,383	3,144,552
Total, 1869–1925	-------	----------	37,178,984	188,714,953	198,917,644	1,182,951,664	19,490,802	278,556,609

[1] Includes 131,193 tons of tailings and 54,378 tons of ore leached.

NOTE.—Total dividends, 1869–1925, $42,651,146.

The value of the metals from the Tintic district in 1925 was as follows: Gold, $828,028, against $591,405 in 1924; silver, $6,592,601, against $5,530,526; copper, $657,003, against $403,001; lead, $7,984,730, against $6,507,877; zinc, $125,221, against $10,222. The ore and tailings sold or treated in the district in 1925 yielded on an average $29.26 in metals a ton, compared with $33.04 in 1924.

Mine production of gold, silver, copper, lead, and zinc in Tintic district, Utah, in 1925, by kinds of ore

Kind of ore	Number of producers	Ore and tailings	Gold	Silver	Copper	Lead	Zinc
		Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*
Dry and siliceous	19	[1]280,818	27,915.26	3,243,841	3,433,013	5,621,360	----------
Copper	2	966	157.30	12,735	130,945	9,308	----------
Lead	22	[2]261,759	11,758.19	6,174,978	1,052,848	84,555,197	----------
Zinc	1	219	----------	----------	----------	18,400	86,206
Lead-zinc	3	9,391	225.09	67,871	9,976	1,574,241	1,561,436
	----------	553,153	40,055.84	9,499,425	4,626,782	91,778,506	1,647,642

[1] Includes 114,163 tons of tailings and 54,378 tons of ore leached.
[2] Includes 17,030 tons of tailings.

The ore output of the Chief Consolidated Mining Co. was 161,781 tons in 1925, much larger than the output of any former year, though the grade of the ore was slightly lower than in 1924. After transportation, sampling, and all operating charges were deducted the ore yielded a profit of $347,182.13. Dividends paid May 1 and November 1 totaled $214,192.90. The combined output of all properties is given as follows in the company's annual report:

Ore and metals produced by Chief Consolidated Mining Co. in 1925 and 1909–1925.

Year	Ore	Gold	Silver	Copper	Lead	Zinc	Net returns	
							From smelter	After charges
	Dry tons	*Ounces*	*Ounces*	*Pounds*	*Pounds*	*Pounds*		
1925	161,781	16,758	2,751,500	1,563,183	[1] 22,204,007	2,849,612	$2,441,215	$347,182
1909–1925[2]	1,179,834	114,909	32,004,891	4,881,328	178,350,669	5,668,311	[3] 24,817,902	[3] 5,865,199

[1] Represents 20,472,275 pounds of lead in lead ore shipped and 1,731,732 pounds of lead in zinc-lead ore milled.
[2] The production of the Chief Consolidated mine by years is given in Mineral Resources, 1918, pt. 1, p. 388.
[3] Includes returns on 360,716 pounds of manganese in 1918.

Of the 161,781 tons of ore produced, 50,770 tons of silver-lead ore and 54,236 tons of dry and siliceous ore were shipped to smelter; 9,989 tons of zinc-lead ore were shipped to the custom concentration plant at Midvale; and the concentrator at the Chief mine took 46,786 tons, of which 36,562 tons were silver-lead ore, 9,439 tons were dry gold and silver ore, and 785 tons were zinc-lead ore. These ores averaged as follows: Gold, $2.15; silver, 17.01 ounces; lead in lead ores, 11.72 per cent; copper in copper ores, 2.53 per cent; lead in zinc-lead ores, 8.03 per cent; and zinc in zinc-lead ores, 13.22 per cent. All ores averaged $29.09 a ton in total value, which, after deducting $14 for smelting, freight, and sampling, left a net value of $15.06 a ton. Development done (in drifts, raises, and winzes) from shaft No. 1 of the Chief mine amounted to 26,267 feet; at the Grand Central mine, or No. 5 shaft, 5,171 feet; and at the Gemini and Ridge & Valley No. 3 shaft, 225 feet. The Plutus mine, developed by the Chief Consolidated Mining Co., is credited with 3,195 feet of work, and the Apex Standard mine with 1,779 feet. From the No. 1 and No. 5 shafts 23,851 feet of prospect drilling was done. Paragraphs from the company's[2] annual report follow:

> The task of the general development work in the opening of the Chief mine having been completed, there remained only such work as was necessary to preserve the continuation of the ore channels. This permitted of a considerable reduction in these costs, but it was and will be necessary to continue this same class of work in connection with the finding of new channels and the continued development work in connection with the reopening of the No. 5 workings.
>
> The wet end of the concentrating plant during the past year has contributed somewhat to the earnings and the improvements that are being made in that part for the treatment of the largely increasing product of zinc and the further improvements covering the volatilization end of the mill, all of which it is hoped to complete during the first half of the present year, should lead to and be productive of more profit and the completion of the long-drawn-out expenditures.

From the Eagle & Blue Bell mine[3] 25,874 dry tons of ore were shipped, yielding 1,896 ounces of gold, 228,602 ounces of silver, 3,890,945 pounds of lead, and 38,429 pounds of copper, for all of which the net smelter return was $266,141.63. Dividends were distributed to stockholders in 1925 amounting to $178,629.20. The company's report says:

[2] Chief Consolidated Mining Co., Ann. Rept. for year ended Dec. 31, 1925.
[3] Bingham Mines Co., Seventeenth Ann. Rept., for year ended Dec. 31, 1925.

The most outstanding development occurred in the southerly part of the property at depth where, by means of long-hole drilling, an ore body was discovered which has already been exploited for a distance of 200 feet. A large body of low-grade quartz, inclosing small bunches of higher grade ore, was also discovered below on the 1,875 level. These two ore bodies trend toward one another.

Developments in the northern part of the property have been quite satisfactory and produced a small tonnage of low-grade silver-lead.

In the central part of the property two approximately parallel fault fissures are being developed on the 2,100 level, which at higher horizons have shown a marked relationship to valuable ore bodies.

The Victoria property of the Bingham Mines Co. produced 22,282 dry tons of ore yielding 1,774 ounces of gold, 768,115 ounces of silver, 4,952,223 pounds of lead, and 176,554 pounds of copper, for which the smelter paid $669,548.93. This ore came from two ore bodies which were opened late in 1924 below the 1,300-foot level. These deposits were followed for a considerable distance on a lower level where they become one. Nothing of importance has been found in the company's Snow Flake property.

Conditions at the American Star property of the Bingham Mines Co. have not changed during the past year. Shipments from the exploitation of the large quartz deposit amounted to 2,849 tons, yielding 143 ounces of gold, 36,678 ounces of silver, 5,541 pounds of lead, and 10,291 pounds of copper, which altogether brought $14,092 at the smelter.

The Bullion Beck & Champion mine remained closed, but shipments of ore and old tailing from the dumps of the property amounted to 55,413 tons.

Ore sales from the Empire Mines' property amounted to $19,556 for silver, lead, copper, and some gold. From the 1,800-foot level of the Empire shaft, development was under way in the adjoining Gold Chain ground.

The Tintic Standard mine[4] produced 152,555 dry tons of ore, containing 6,495.65 ounces of gold, 4,080,879 ounces of silver, 48,072,818 pounds of lead, and 1,033,155 pounds of copper, which altogether sold for $7,116,629. After smelter, freight, and treatment charges of $1,981,766 were deducted, the net smelter returns amounted to $5,134,863. The mining and milling cost amounted to $1,550,323. Deduction of general administrative expense, $84,801, and annual depreciation of plant and equipment, $150,371, from the operating income left a net operating income, before allowance for depletion and Federal taxes, of $3,349,368, which was increased to $3,598,242 by $248,874 nonoperating income. Deduction of $235,406 for State and county taxes, $334,207 for Federal income taxes, and $5,642 for capital stock and license taxes, totaling $575,255, left $3,022,987 net income. On December 31, the total current assets of the company were $4,023,756. Dividends of $1,959,955 paid in 1925 bring the total disbursements of the company to $5,522,713. Ore shipments consisted of four and sometimes five classes of ore. The lead in the ore occurred as galena, anglesite, and cerussite, carrying silver. The lead ore was siliceous, averaging 40 per cent of silica, 4 per cent of iron, and 0.35 per cent of copper. The silver or dry ore has silica

[4] Tintic Standard Mining Co., Ann. Rept. for year ended Dec. 31, 1925.

and barite as gangue minerals and contains only a little gold, lead, and copper. The content of silica is about 80 per cent. Typical assays of the ores shipped were as follows:

Assays of ores shipped from the Tintic Standard mine

	Dry and siliceous ore	Lead-silver ore	Mill ore	Sulphide ore	Rich silver lead ore
Gold, ounce	0.10	0.037	0.032	0.033	0.20
Silver, ounces	98.00	31.000	18.500	19.000	220.00
Lead, per cent	3.31	28.870	5.220	4.000	18.00
Copper, do	.62	.350	.370	.350	1.30
Iron, do	----------	4.000	----------	10.000	----------
Sulphur, do	----------	----------	----------	16.000	----------

The property of the Iron Blossom Mining Co. was taken under control by the Tintic Standard Mining Co. in 1925, and the profits of its operations are included in the published statement of the Tintic Standard Mining Co. This company also assumed control of the property of the Colorado Consolidated Mining Co., which continued to be worked by several sets of lessees under the direction of the old company.

Parsons has summarized the history of the Tintic Standard mine[5] and described the mill and the process of brine leaching.[6]

The Tintic Standard milling plant at Harold, Utah, was closed in November, and the low-grade siliceous ore formerly treated was shipped to the Garfield smelter under a favorable smelting contract.

The Mountain View Mining Co. produced more than 1,000 tons of oxidized lead ore from the May Day and Uncle Sam mines, and the Yankee Consolidated Co. produced several hundred tons of oxidized lead ore besides several lots of silver ore from its Yankee mine. Prospecting was done from the Yankee tunnel in claims newly acquired by the International Smelting Co. The Eureka Lilly property, which is between the Tintic Standard and North Lilly property, is controlled by the Chief Consolidated Mining Co. The International Smelting Co. controls the North Lilly Mining Co., and under contract with the Tintic Standard Mining Co. was drifting from the 700-foot level of the No. 2 shaft of the Tintic Standard mine into North Lilly ground.

Iron ore containing a little manganese was shipped from the Iron King mine to smelters for flux and also to iron furnaces at Ironton for its manganese content. This ore, averaging about 53 per cent of iron and 4.5 per cent of manganese, was obtained from the porphyry-limestone contact in the vicinity of the old shaft, according to Crane.[7] New developments in the mine opened up gold-silver ore discovered in the vicinity of the new shaft. Here the ore impregnates a wide north-south zone of highly fractured Tintic quartzite and cements the plane of a strong fissure striking N. 20° W. within the fractured zone. Ore has been mined from the fissure by an

[5] Parsons, A. B., "The Tintic Standard mine": Eng. and Min. Jour.-Press, vol. 120, Aug. 8, 1925, pp. 205–210, and Oct. 24, pp. 645–652.

[6] Parsons, A. B., "The Tintic Standard reduction plant": Eng. and Min. Jour.-Press, vol. 120, Aug. 22, 1925, pp. 284–285.

[7] Crane, G. W., Notes on the Geology of East Tintic: Paper No. 1491-I, read at the Salt Lake City meeting, Am. Inst. Min. and Met. Eng., September, 1925.

inclined raise from the 1,565-foot level to the 1,300-foot level. About 360 tons of ore were shipped, averaging approximately $4 in gold and 12 ounces of silver to the ton, and also about 1.5 per cent of copper.

The Apex Standard mine is opened by two shafts and about 7,000 feet of laterals. No. 1 shaft is 900 feet deep and No. 2 shaft, 1,500 feet to the north of it, is 950 feet deep. These shafts are connected by a drift from the 900-foot level of the No. 1 shaft which affords good ventilation. Shipments during January and February, 1925, amounted to 136 tons of silver-lead ore, averaging 0.12 ounce of gold and 14 ounces of silver to the ton, 19.3 per cent of lead, and a little copper. The gangue minerals are quartz and barite, and the ore is mostly oxidized.

Development at the Zuma mine consists of a 1,300-foot shaft and about 8,000 feet of drifts and raises. Much of the work was done on the 1,200 and 800 foot levels. About 140 tons of silver ore was shipped in 1925, the last shipment of 40 tons averaging 0.016 ounce of gold and 19.95 ounces of silver to the ton, 3.5 per cent of lead, and 0.71 per cent of copper.

Exposure of a new ore body in the Mammoth mine enabled the operating company to renew payment of dividends. The Mammoth tailing dump from the old mill site was being shipped at the rate of about 4,000 tons a month to a smelter near Salt Lake City. Shipments of old tailing were also started from the dump of the Tintic Milling Co. Other producers of ore were the Alaska, Empire, Tintic Drain Tunnel, Godiva, Gold Chain, Dragon, Mammoth No. 2, Silver Park, Showers, and Swansea mines.

West Tintic district.—The Scotia property in the West Tintic district was virtually idle during 1925, except for work done in retimbering the old shaft; during this work one lot of lead ore was shipped to the smelter.

MILLARD COUNTY

Kanosh district.—Oxidized zinc ore and some lead ore were loaded on railroad cars at Fillmore for shipment to smelters. All the ore was mined from shallow workings in limestone at the Blue Bell property, which lies 12 miles south of Kanosh in the southern part of the Kanosh district.

MORGAN COUNTY

Argenta district.—The North Maxfield property was opened in 1925, and 29 tons of oxidized lead ore yielding a little silver were shipped to a smelter.

PIUTE COUNTY

Mount Baldy district.—The Deer Trail mine and mill were inactive on company account during 1925, but lessees managed to ship considerable ore containing gold, silver, and lead.

Ohio district.—From the Bully Boy and Webster property the Utah Lead Co. shipped oxidized lead ore. The Wedge mine produced one small lot of gold ore.

SALT LAKE COUNTY

Big and Little Cottonwood districts.—Seven producers in the Big Cottonwood district reported the output of 5,578 tons of ore, which yielded $1,299 in gold, 100,535 ounces of silver, 82,674 pounds of copper, and 2,307,827 pounds of lead, valued in all at $283,591, or $50.84 a ton. Most of the lead ore came from the Cardiff mine, where it was taken out during development work that embraced 500 feet of raising and 1,600 feet of drifts. The company paid no dividends in 1925. Small lots of lead ore carrying silver were shipped from the Gold Eagle, Golden Porphyry, Maxfield, and Prince of Wales properties.

In the Little Cottonwood district nine producers reported the output of 7,987 tons of ore, which yielded $4,482 in gold, 154,218 ounces of silver, 129,547 pounds of copper, and 2,440,429 pounds of lead, valued in all at $342,222, or $42.85 a ton. The chief producers of ore in the Little Cottonwood district were the Columbus-Rexall, Columbus, Flagstaff, Emma Silver, Michigan-Utah, Alta Merger, and West Toledo properties.

Mine production of gold, silver, copper, and lead in Big Cottonwood and Little Cottonwood mining districts, Utah, in 1925

	Number of producers	Ore and slag	Gold	Silver	Copper	Lead	Zinc	Total value
		Short tons		*Fine ounces*	*Pounds*	*Pounds*	*Pounds*	
1925	16	[1]13,565	$5,781	254,753	212,221	4,748,256	----------	$625,813
Increase or decrease from 1924	+5	−3,063	+723	−168,423	−34,079	−1,508,573	----------	−195,584
Total, 1867–1925	-------	585,458	553,231	16,005,239	14,909,303	225,616,036	322,055	32,462,150

[1] Includes 1 ton of slag.

During 1925 the Emma Silver mine[8] produced 591 tons of smelting ore, which yielded 64.3 ounces of gold, 11,775 ounces of silver, 283,296 pounds of lead, 2,772 pounds of copper, and 279,424 pounds of iron, valued in all at $28,541. Smelting, freight, and selling charges amounted to $7,196, leaving net smelter returns of $21,345. Most of the ore produced from the Emma mine came from near the Snow fault, where high-grade silver-lead ore was discovered in December, 1924. This ore brought $45 a ton after smelter and freight charges were deducted.

The Alta Merger mines,[9] a combination of the property interests of 24 separate companies, produced 102 tons of ore which contained 5.58 ounces of gold, 1,850 ounces of silver, 1,898 pounds of copper, 18,242 pounds of lead, and 23,975 pounds of iron, valued in all at $2,819. The smelting, freight, and selling charges amounted to $1,303, leaving net smelter returns of $1,516. All the ore came from the "Gold Ore" stope. The development work by the company amounted to 300 feet of raises and 410 feet of drifts and crosscuts.

[8] Emma Silver Mines Co., Ann. Rept. for year ended Dec. 31, 1925.
[9] Alta Merger Mines Co., Ann. Rept. for year ended Dec. 31, 1925.

The Mineral Veins Coalition Mines Co. owns the Wasatch drain and transportation tunnel, through which it plans to develop at deeper levels the old Columbus Consolidated, Flagstaff, Columbus-Rexall, and other mines. Lessees mined ore from the Braine fissure at points in raises above the drain-tunnel level.

Bingham or West Mountain district.—In 1925 the mines of the Bingham district produced ore yielding on an average $3.70 in metals a ton, against $3.23 a ton in 1924. Shipments of ore to the smelter amounted to 210,818 tons, against 95,952 tons in 1924; the output of concentrating ore was 12,929,532 tons, against 12,612,508 tons in 1924; and the quantity of concentrates produced was 751,870 tons, against 752,025 tons in 1924. Ore of smelting grade, amounting to 210,818 tons, consisted of low-grade copper and lead sulphides; it yielded 17,384.70 ounces of gold, 1,292,740 ounces of silver, 4,973,604 pounds of copper, and 48,929,232 pounds of lead, valued in all at $6,219,631, or $29.50 a ton. Milling ore, of which there was 12,929,532 tons, produced 751,870 tons of copper, lead, zinc, and lead-zinc concentrates yielding 95,664.40 ounces of gold, 2,140,726 ounces of silver, 215,278,565 pounds of copper, 61,035,023 pounds of lead, and 26,355,731 pounds of zinc, valued in all at $41,345,862, or $54.99 a ton of concentrates. In addition, copper precipitates, recovered from mine water and from leaching ore in place, yielded 12 ounces of silver and 7,359,866 pounds of copper.

Mine production of gold, silver, copper, lead, and zinc in Bingham or West Mountain district, Utah, in 1925

	Number of producers	Ore	Gold	Silver	Copper	Lead	Zinc	Total value
		Short tons		*Fine ounces*	*Pounds*	*Pounds*	*Pounds*	
1925	29	13,140,350	$2,336,932	[1]3,433,478	[1]227,612,035	109,964,255	26,355,731	$48,610,601
Increase or decrease from 1924	+8	+431,790	+220,289	+938,780	−8,568,587	+40,392,421	+14,878,519	+7,571,082
Total, 1865–1925	-------	----------	[2]44,478,555	[2]64,380,216	2,896,800,854	1,538,479,406	96,092,199	690,952,279

[1]Includes 12 ounces of silver and 7,359,866 pounds of copper saved from precipitates.
[2]Includes placer production.

NOTE.—Total dividends, 1865–1925, $151,201,287.

Mine production of gold, silver, copper, lead, and zinc in Bingham or West Mountain district, Utah, in 1925, by kinds of ore

Kind of ore	Number of producers	Ore	Gold	Silver	Copper	Lead	Zinc
		Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*
Dry and siliceous	5	7,160	902.66	71,376	55,957	104,293	------
Copper	11	12,570,975	83,787.06	927,067	223,053,226	683,234	------
Lead	19	171,283	10,868.77	1,064,361	2,671,293	48,178,683	----------
Lead-zinc	14	390,932	17,490.61	1,370,174	1,881,559	60,998,045	26,355,731
	-------	13,140,350	113,049.10	[1]3,433,478	[1]227,612,035	109,964,255	26,355,731

[1]Includes 12 ounces of silver and 7,359,866 pounds of copper saved from precipitates.

During 1925 the Utah Copper Co.[10] produced 34,351 tons of ore a day, or a total of 12,538,300 tons of ore that contained 1.02 per cent of copper. This ore was mined by steam and electric shovels and treated at the Magna and Arthur concentrating plants. Concentrate recovered during 1925 yielded 214,162,139 pounds of copper, 692,782 ounces of silver, and 78,158.43 ounces of gold, valued in all at $32,171,883. This output included 675 tons of crude ore shipped by lessees and 721,357 pounds of copper recovered from mine water. The concentrate shipped to the smelter averaged 17.47 per cent of copper in 1925, against 18.07 in 1924.

After all operating charges of production, including cost of marketing refined copper, the direct profits from mining operations for the year were $12,419,561. Indirect earnings for the period, accruing as miscellaneous income appertaining to operations, amounted to $868,416.67, which with an income of $250,125 from outside investments made a total income of $13,538,103. The audit report shows deduction for nonoperating charges for Federal income-tax accruals, depreciation of plant and equipment, and obsolescence or retirement of property, a total deduction of $2,434,598, leaving a net income carried to surplus account of $11,103,505, or approximately $6.83 per share of capital stock outstanding.

Dividends paid to stockholders in 1925 amounted to $4.25 a share, or a total of $6,904,083, of which about half was capital distribution. A revised calculation of developed ore reserves on December 31, 1925, as they will be mined, gave 514,000,000 tons of milling ore carrying approximately 1.15 per cent of copper. The total ore mined to date was 131,894,551 tons. Therefore the total ore mined and to be mined from the beginning of mining to the exhaustion of the estimated reserves approximates 646,000,000 tons.

The mining cost for a ton of ore milled, including a proper apportionment of fixed general charges (but not including Federal taxes and depreciation) was 33.73 cents, of which 12.5 cents represents proportional "prepaid" stripping charges. The actual direct mining cost of all ore was 21.23 cents a ton, of which 17.11 cents represents all mine charges; the balance, or 4.12 cents, represents fixed and general charges.

The ore treated at the Magna and Arthur plants was 6,662,100 tons and 5,876,200 tons, respectively, or a total of 12,538,300 tons, equivalent to a daily average of 34,351 tons. The average content of ore was 1.02 per cent of copper, as compared with 1.07 per cent of copper in 1924; and the average recovery was 86.96 per cent as compared with 85.94 per cent in 1924. The average milling cost was 54 cents a ton, a decrease of 6 cents from the cost for 1924. At the Magna plant during 1925 the standard mixture of flotation reagents used, creosote oil in combination with sulphuric acid, was replaced by a new combination—sodium xanthate and lime. Shortly after this change the gravity concentrating department was abandoned, and the cost of operating it was saved without any metallurgical losses being incurred. Use of the new reagents and elimination of the gravity-concentration equipment effected a material reduction in milling cost.

[10] Utah Copper Co., Twenty-first Ann. Rept., for year ended Dec. 31, 1925.

The average cost per net pound of copper, including depreciation of plant and equipment and all fixed general expenses, and after crediting gold, silver, and miscellaneous earnings, was 8.43 cents, as compared with 8.89 cents, computed on the same basis, for 1924. The value of gold and silver recovered and the miscellaneous earnings amounted to 1.36 cents per pound of copper, as compared with 1.206 cents for 1924.

Greater efficiency at the mine and mills has made practicable the treatment of low-grade ores heretofore not considered profitable; accordingly, the grade of the ore treated in 1925 was lowered in the aggregate by reason of milling much low-grade material which before had gone to the waste dumps.

In 1925 the bulk of the ore from the Bingham Mines Co.[11] was lead-silver ore from the Lark vein of the Dalton & Lark group; some gold-silver siliceous ore was mined from the Lead mine vein and lead-zinc ore from the Brooklyn vein. Lessees at the Commercial property mined 301 tons of lead ore, but no work was done on company account at either the Commercial or Yosemite mines. During the year the company purchased the Yosemite property (64.43 acres) and a controlling interest in the Montana-Bingham Consolidated property (276.6 acres), all adjoining the Dalton & Lark group, also the Ute Copper Co. near by (140 acres) and the Watson claims of 28 acres, as well as property in the Tintic mining district of Juab County. The company's output in the West Mountain district was as follows:

Mine production of gold, silver, copper, lead, and zinc by the Bingham Mines Co., Bingham, Utah, in 1925, by mines

Mine	Ore	Gold	Silver	Copper	Lead	Zinc	Smelter returns
	Dry tons	*Ounces*	*Ounces*	*Pounds*	*Pounds*	*Pounds*	
Dalton & Lark	30,345	1,214	304,313	386,214	5,370,749	609,489	$351,361
Commercial	302	11	2,250	10,458	123,937	62,345	8,593
	[1]30,647	1,225	306,563	396,672	5,494,686	671,834	359,954

[1] Includes 2,498 tons of mill ore shipped to custom plants, which produced lead concentrate and zinc concentrate. An estimate of the recovered zinc was 481,935 pounds.

Dividends paid to stockholders by the Bingham Mines Co. in 1925 amounted to $167,375.

Leaching of ore "in place" continued during 1925 at the property of the Ohio Copper Co.;[12] 6,271,556 pounds of copper were produced at a cost of 8.3216 cents a pound, compared with 5.815 cents a pound in 1924. The net profits, after deduction of fixed charges, taxes, adjustments, etc., but not of depreciation and depletion, amounted to $237,318.57. On December 1 the company paid a dividend of 5 per cent, amounting to $144,976.75. Difficulties encountered early in 1925 interfered with operations; they were due largely to the condition of the water used for leaching.

[11] Bingham Mines Co., Seventeenth Ann. Rept., for year ended Dec. 31, 1925.
[12] Ohio Copper Co., Ann. Rept. for year ended Dec. 31, 1925.

Anderson and Cameron have described the work done by the Ohio Copper Co.[13]

In the property of the Montana-Bingham Consolidated Co. a number of ore bodies were opened in 1925 in the Tiewaukee mine, and a little low-grade ore, mined from the beddings and fissures, was shipped. In addition, copper precipitate valued at $9,007 was recovered from mine water.

Ore from the United States Smelting, Refining & Mining Co.'s mines,[14] including the Niagara property, amounted to 209,471 tons of lead-zinc ore, an increase of 36,961 tons over 1924. This ore was shipped from Bingham to the concentrator at Midvale, and the excess over the preceding year was largely ore in stock at the mill.

In the property of the Utah Metal & Tunnel Co.,[15] development work was under way in cooperation with the owner of adjoining property, the Utah Delaware Mining Co., which found extensive mineralization on the 1,800-foot level near the boundary line of the two properties. With an agreement to prospect the mineralized area, copper ore 8 feet thick, averaging 10 per cent of copper, was discovered by the Utah Delaware Mining Co. in January, 1926. During the year lessees of the Utah Metal property, working in upper stopes of the mine, shipped 4,780 dry tons of ore, containing 521.63 ounces of gold, 37,277 ounces of silver, 70,224 pounds of copper, 645,882 pounds of lead, and 367,740 pounds of zinc, for which the company received $92,099. As about 3,300 tons of this ore containing zinc was sold to custom mills, all the metals reported were not recovered. The water from the tunnel continues to be a source of revenue; the sales amounted to $29,894, which with the proceeds of the ore and rents totaled $123,827. Operating expenses were $153,219 and development $20,273; $10,869 was charged off for depletion and depreciation, and a net loss of $60,534 was carried to surplus.

The Utah-Apex Mining Co. produced, according to a report to the Bureau of Mines for the calendar year, 246,152 tons of ore, of which 138,196 tons were shipped directly to the smelters, and 107,956 tons were milled, producing 30,713 tons of lead concentrate and 1,247 tons of zinc concentrate. Some of the ore was sold to custom mills which produced both lead and zinc concentrates. The lead concentrate contained 2,379.15 ounces of gold, 237,358 ounces of silver, 740,329 pounds of copper, and 14,745,803 pounds of lead. The zinc concentrate contained 39.42 ounces of gold, 3,264 ounces of silver, 46,566 pounds of copper, 55,227 pounds of lead, and 1,246,314 pounds of zinc. The smelting ore (138,196 tons), including 5,430 tons of mill ore, contained 8,802.23 ounces of gold, 729,610 ounces of silver, 4,024,615 pounds of copper, and 30,903,398 pounds of lead. The zinc content (15,485,795 pounds) of the ore was not recovered, except the small part saved from mill ore shipped to a custom plant.

The Utah-Apex mine, according to the company's fiscal report,[16] is developed to the 2,400-foot level by a vertical 3-compartment shaft. Below the 2,400 level the shaft was being sunk as a 4-compartment shaft. Most of the development at the 2,400 level was done through the Yampa shaft of the Utah Delaware Mining Co., which was con-

[13] Anderson, A. E., and Cameron, F. K., "Recovery of copper by leaching, Ohio Copper Co. of Utah": Trans. Am. Inst. Min. and Met. Eng., vol. 63, pp. 31-57, 1925.
[14] United States Smelting, Refining & Mining Co., Ann. Rept. for 1925.
[15] Utah Metal & Tunnel Co., Ann. Rept. for year ended Dec. 31, 1925.
[16] Utah-Apex Mining Co., Ann. Rept. for year ended Aug. 31, 1925.

nected with the new Apex shaft in 1925. The problem of profitable recovery of zinc from lead-zinc ores was gradually being solved by improvements at the mill, which now has a capacity of 350 tons of ore daily. On November 10 recovery of zinc concentrate as well as lead concentrate was started by the selective flotation of ore averaging 10 per cent of lead and 8 per cent of zinc. This ore was first crushed to 1¼-inch size and then ground to 80 mesh in Marcy mills. The pulp was concentrated into two products—lead concentrate containing 52 per cent of lead and a zinc concentrate carrying 52 per cent of zinc. Total dividends approximating $2,661,660, of which $686,660 was paid in 1925, have been distributed to stockholders.

The Park-Bingham properties, worked partly by lessees, are reached through the Butterfield tunnel—a 12,000-foot adit extending in a northeasterly direction through the Lavagnino Conglomerate (Queen) property and cutting the Park-Bingham ore deposits 1,500 to 1,800 feet below the surface and 10,000 feet from the portal of the tunnel. The Niagara shaft of the United States Smelting, Refining & Mining Co. mine connects with the end of the tunnel. The output in 1925 was 1,748 tons of ore, containing gold, silver, lead, a little copper, and about 5 per cent of zinc. Part of the ore was milled at Midvale, but the first-class ore carrying 20 to 31 per cent of lead was smelted.

Other producers in the district were the Congor, Queen (Lavagnino), National, New England, Lead Silver Mines Co., Bingham Coalition, Utah Delaware, Utah-Bingham, and Chicago mines.

Smelter district.—Ore in small lots from car and track cleanings amounted to 85 tons. The Midvale concentrator of the United States Smelting, Refining & Mining Co.[17] handled 172,510 tons of lead-zinc custom ore, largely from Bingham. The lead smelter treated 267,178 tons of marginal ore, producing 50,326 tons of bullion, an increase of 10,099 tons of bullion over the preceding year. The plans for the new concentrator were changed to increase the capacity from 500 to 750 tons a day. The plant is to be of fireproof construction and thoroughly modern in design.

SUMMIT AND WASATCH COUNTIES

The Blue Ledge and Snake Creek districts in Wasatch County and the Uintah district in Summit County represent the producing area of the Park City region.

Mine production of gold, silver, copper, lead, and zinc in Park City mining region, Utah, in 1925

	Number of producers	Ore and old tailings	Gold	Silver	Copper	Lead	Zinc	Total value
		Short tons		*Fine ounces*	*Pounds*	*Pounds*	*Pounds*	
1925	18	[1]635,204	$353,401	7,236,652	2,465,670	81,312,417	23,240,364	$14,566,210
Increase from 1924	5	223,412	93,407	1,623,112	380,764	14,619,687	16,453,560	4,495,462
Total, 1870–1925	-------	----------	5,657,310	168,729,764	12,345,218	1,574,202,980	111,828,566	228,583,580

[1] Includes 141,417 tons of old tailings.

NOTE.—Total dividends, 1870–1925, $51,403,188

[17] United States Smelting, Refining & Mining Co., Ann. Rept. for 1925.

Mine production of gold, silver, copper, lead, and zinc in Park City mining region, Utah, in 1925, by kinds of ore

Kind of ore	Number of producers	Ore and old tailings	Gold	Silver	Copper	Lead	Zinc
		Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*
Dry and siliceous	3	[1] 47,492	2,645.79	846,394	166,386	1,095,486	----------
Lead	12	[2] 179,926	2,886.27	2,288,706	971,599	33,762,446	----------
Lead-zinc	9	[3] 407,786	11,563.72	4,101,552	1,327,685	46,454,485	23,240,364
	------	635,204	17,095.78	7,236,652	2,465,670	81,312,417	23,240,364

[1] Includes 13,457 tons of old tailings.
[2] Includes 109,960 tons of old tailings.
[3] Includes 18,000 tons of old tailings reconcentrated

The Silver King Coalition Mines Co.[18] produced 57,913 tons of crude ore which was shipped directly to the smelters and 85,388 tons of second-class or mill ore, a total of 143,301 tons. The cost of production was $1,544,566, or $10.78 a ton, for mining, milling, and other charges, including depreciation ($56,437). Taxes amounted to $394,478, making the total expenditure $1,939,044. The net operating profit in 1925 was $2,215,806. The ore milled amounted to 85,388 tons, yielding 8,879 tons of lead concentrate, 9,324 tons of iron concentrate, and 750 tons of zinc concentrate. Lessees mined 170 tons of silver-lead ore, and the company mined 406 tons of crude iron ore. The accompanying table gives the average metal contents of all products from the property.

Gold, silver, copper, lead, and zinc contained in the products of the Silver King Coalition mine, Utah, in 1925

Kind of material	Gold		Silver		Copper		Lead		Zinc		Net smelter returns
	Per ton	Total	Per ton	Total	Percentage	Total	Percentage	Total	Percentage	Total	
	Ounces	*Ounces*	*Ounces*	*Ounces*		*Pounds*		*Pounds*		*Pounds*	
First-class ore	0.0422	2,418.16	36.20	2,077,044	1.01	1,159,173	28.31	32,461,590	-----	--------	$3,181,744
Lead concentrate	.0746	662.21	44.16	392,054	1.07	189,440	40.84	7,251,693	-----	--------	701,706
Iron concentrate	.0316	294.55	8.45	78,833	.28	53,068	10.45	1,948,214	-----	--------	150,928
Zinc concentrate	.0140	10.48	17.39	13,041	.80	11,996	3.85	57,733	49.49	742,362	26,995
Crude iron ore	.0348	14.14	34.75	14,107	1.90	15,438	9.04	73,390	-----	--------	11,757
Lessees' ore	.1156	19.66	36.71	6,240	.94	3,180	30.23	102,779	-----	--------	[1] 2,926
Zinc middlings (1923)	-------	--------	-------	--------	-----	--------	-----	----------	-----	--------	819
	-------	3,419.20	-------	2,581,319	-----	1,432,295	-----	41,895,399	-----	742,362	4,076,875

[1] Sold for $10,555.17.

At the mine and mill of the Silver King Coalition property various improvements were made, the most important being a new steel and concrete addition to the mill building. A new selective flotation unit was added consisting of 12 Mineral Separation cells of 250 tons capacity for separating lead, 12 more cells for separating zinc, and the necessary grinding machinery. The improved mill began work

[18] Silver King Coalition Mines Co., Ann Rept. for year ended Dec. 31, 1925.

January 3, 1926. In the mine, more than 20,000 feet of new and heavier rails replaced old rails, and new power lines to carry the additional electric energy replaced the lighter lines.

ThePa rk City Mining & Smelting Co. was organized in 1922 to include the mines of the Daly West, Judge Mining & Smelting, and West Ontario companies. On September 1, 1925, this company and the Park Utah mines were combined to form the Park Utah Consolidated Mines Co. The control of the Daly and Ontario Silver companies was also consummated. According to the annual report of the new company [19] the combined output of all the mines in 1925 amounted to 315,371 tons of ore, containing 16,746 ounces of gold, 4,815,002 ounces of silver, 1,711,455 pounds of copper, 36,931,081 pounds of lead, and 34,827,061 pounds of zinc. Much of this zinc was lost, as it was in the lead ore and concentrate shipped directly to lead smelters. The bulk of the ore was milled, and the zinc recovered from the zinc concentrate was probably about 20,000,000 pounds. The total metal contents of the ore output of each mine follow:

Gold, silver, copper, lead, and zinc contained in ore mined from the properties under control of the Park Utah Consolidated Mines Co., Utah, in 1925

Mine	Ore	Gold	Silver	Copper	Lead	Zinc	Value received per ton
	Short tons	*Ounces*	*Ounces*	*Pounds*	*Pounds*	*Pounds*	
Park Utah	145,545	13,920	2,932,102	555,097	8,004,325	13,850,102	$13.76
Park City	145,851	2,055	1,179,170	932,222	26,412,412	19,123,033	15.90
Ontario	[1]23,044	740	684,461	215,840	2,435,882	1,845,791	15.34
Daly	331	31	19,269	8,296	78,462	8,135	44.04
	315,371	16,746	4,815,002	1,711,455	36,931,081	34,827,061	14.90

[1] Tailing shipped not included.

Three dividends of $131,400 were paid to stockholders of the Park City Mining & Smelting Co. in 1925, and in September the Park Utah Consolidated Mines Co. paid its initial dividend of $314,025, or a total for the combined properties of $708,225. Paragraphs from the company's annual report follow:

The two important developed tonnages have been at opposite ends of the property. On the Park City unit side the upper middle vein deposit has been followed westerly an additional 800 feet. It shows increased lead content and is of undiminished size. On the Park-Utah unit side the large ore shoot west of the main crosscut was picked up on the 1,800 level, 300 feet below the lowest previous exposure. Developments indicate that the ore shoot is improving in size and grade on its downward extension. The reserves represented by this ore body are still untouched under the 1,500 level, as extraction can not commence until early the coming summer when the new shaft to the 1,500 level will be completed and adequate hoisting equipment installed. * * *

The questioi oi transportation between the Judge concentrator and the railroad has been effectively solved by the erection of an aerial tramway 4,700 feet long between the concentrator and the railroad spur at the Ontario No. 1 Drain Tunnel. * * * It is equipped for both the downhaul of ores and the uphaul of timber, coal, and supplies. * * *

The Keystone mine is opened by a tunnel 4,500 feet long and a shaft 400 feet deep; most of the ore mined in 1925 was from the 500-

[19] Park Utah Consolidated Mines Co., Ann. Rept. for year ended Dec. 31, 1925.

foot level. The output amounted to 34,150 tons of ore; 29,867 tons of this were treated in the company's concentrator and produced 5,030 tons of lead concentrate and 1,476 tons of zinc-iron middling. The middling was re-treated at a custom mill. Shipments of crude ore of smelting grade amounted to 4,283 tons. The ore and concentrate contained 400.74 ounces of gold, 122,592 ounces of silver, 5,879,128 pounds of lead, and 1,985,681 pounds of zinc; for these metals the company received $425,005. An initial dividend of 7½ cents a share, amounting to $67,500, was paid to stockholders in 1925.

The Glenallen property, comprising 300 acres of mineral land, is opened by a 2,400-foot tunnel, which at its face is 1,100 feet vertically below the surface. Considerable low-grade lead-zinc ore was reported opened on several levels. A little ore left from operations in 1924 was shipped to Midvale.

Other producers in the Park City region were the American Flag, Three Kings, and Kennelly properties. Silver Creek tailings were piled for future shipment to the smelters, and 1,110 tons were shipped during 1925. At the small concentration mills re-treating tailings 126,850 tons of old tailings were reported to have produced 1,201 tons of concentrate—265 tons of zinc concentrate and 936 tons of lead concentrate.

TOOELE COUNTY

In Tooele County 46 producers reported a total output of 75,559 tons of ore, tailings, and slag; this total was 15,326 tons less than that reported by 29 producers in 1924. The gold recovered increased from $17,094 to $36,317, the silver from 331,989 to 516,901 fine ounces, the copper from 403,093 to 1,037,047 pounds, the lead from 6,615,007 to 13,288,081 pounds, and the zinc from 22,860 to 1,164,551 pounds. The total value of all metals increased from $823,018 to $1,786,876.

Clifton district (*Gold Hill*).—Nine producers from the Clifton district reported 13,721 tons of ore, yielding $16,720 in gold, 111,372 ounces of silver, 54,459 pounds of copper, and 1,960,853 pounds of lead, valued in all at $272,339, or $19.85 a ton. Most of the ore—12,079 tons—contained lead and the remainder was shipped for its arsenic content. Shipments of arsenical ore ceased in January, 1925. All the arsenical and some of the lead ore came from the properties operated by the Western Utah Copper Co. and the United States Smelting, Refining & Mining Co. The Garrison Monster mine produced 709 tons of lead ore, averaging about 20 cents in gold and 4 ounces of silver to the ton. The lead content ranged between 11 and 40 per cent and the zinc between 1 and 2.8 per cent; the iron content averaged about 30 per cent; the sulphur, 1.5 per cent; and the lime, 4 per cent. The Rube property shipped about 85 tons of its usual high-grade gold ore, which averaged nearly 8 ounces of gold and 1 ounce of silver to the ton, and about 1 per cent of sulphur, 1 per cent of zinc, 30 per cent of insoluble, 10 per cent of iron, and 20 per cent of lime. The New Baltimore and Wyatt groups also shipped lead ore.

Columbia district.—Lead ore was shipped from the Old Sharp mine and from the property of the Hilltop Mining Co.

Dugway district.—The Francis claim of the Lincoln group produced 159 tons of lead ore containing 2.54 ounces of gold, 688 ounces of silver, 1,500 pounds of copper, and 97,637 pounds of lead. No payment was made for the zinc, which averaged about 6 per cent. The ore was hauled 60 miles northeast to St. John, the loading station on the Union Pacific Railroad, and shipped to the International smelter. The property is opened by shafts and tunnels. All the ore produced during the year was mined in the course of prospecting.

Erickson district.—The Imperial Lead property was worked half of the year. Part of the ore mined was concentrated, and some crude ore containing lead was shipped to a smelter. Two cars of lead ore, mined during development work, were shipped from the Utah Majestic property.

Free Coinage district.—The Salt Lake & Mamie claims, operated by the "L" Marie Mining Co., produced a car of lead ore containing silver. The property, opened by a number of tunnels 90 to 430 feet long, is 7 miles from Dolomite, on the Western Pacific Railroad.

Lakeside district.—During development work two small lots of lead ore were shipped from the Lead Prince mine, which is opened by a 300-foot inclined shaft. From the Monarch mine 154 tons of ore yielding 247 ounces of silver and 59,877 pounds of lead were hauled 18 miles to Delle, the loading station on the Western Pacific Railroad.

North Tintic district.—Several cars of zinc ore, averaging about 20 per cent of zinc and 8 per cent of lead, were shipped from the New Bullion property to an eastern zinc plant, and one car of zinc ore was shipped to Bartlesville, Okla., from the Scranton mine.

Ophir district.—Ten producers in the Ophir district reported an output of 40,358 tons of ore, which yielded $6,322 in gold, 302,742 ounces of silver, 886,271 pounds of copper, 5,890,562 pounds of lead, and 212,159 pounds of zinc, valued in all at $870,879, or $21.58 a ton. Lead concentrate and zinc concentrate were produced from ores milled. Only 1,433 tons of crude ore were of shipping grade. The output of the district includes 6,351 tons of old tailings, the recovered metal content of which is included in the total. Most of the ore and concentrates came from the Ophir Hill mine. Other producers were the Hidden Treasure, Thad Stevens, Three Metals, Kearsarge, Lakes of Kilarney, Buffalo, and Twin Magnolia properties.

Rush Valley district (*Stockton*).—Seven producers in the Rush Valley district reported the output of 19,858 tons of ore, which yielded $13,184 in gold, 97,739 ounces of silver, 90,459 pounds of copper, 4,929,432 pounds of lead, and 901,458 pounds of zinc, valued in all at $591,231, or $29.77 a ton. The chief producers of lead ore were the Honorine and Tip Top properties, the latter worked by the Stockton Lead Co., and the Galena King mine, worked by the Keystone Development Co. Lead ore was shipped also from the Salvation-Hercules and Virginia claims, and some ore, including 500 tons of old tailing, sorted from old dumps was milled for its lead content. The district output includes 13,337 tons of shipping ore and 6,021 tons of milling ore, which yielded 2,118 tons of concentrate containing gold, silver, copper, lead, and zinc.

Silver Islet district.—The properties of the Silver Island Mining Co. and the Utah Silver Lake Mining Co. produced only small lots of lead ore.

Third Term district.—The Third Term property in South Willow Canyon produced 171 tons of lead ore containing a little copper and silver. The ore, which was hauled 9 miles to Marshall, the shipping point, on the Western Pacific Railroad, assayed 7 to 8 per cent of lead and 35 to 40 per cent of iron.

UINTAH COUNTY

Carbonate district.—Some copper ore was shipped to the smelter by parcel post from the "Only Chance" mining claim.

UTAH COUNTY

American Fork district.—Six producers in the American Fork district reported the output of 3,374 tons of ore—most of it of shipping grade. Included in the output was some old lead and silver bearing slag from early smelting operations. The total metal output was valued at $148,195, or $43.92 a ton. The American Leasing Co. and its successor, the Yankee Mines Co., shipped nearly 3,000 tons of copper-gold ore, most of which contained more than an ounce of gold to the ton, 3 to 8 ounces of silver, 2 to 6 per cent of copper, 28 per cent of iron, and 35 per cent of sulphur. This ore was opened in the Live Yankee property and followed into the adjoining Silver Wave mine, which, with the Belorophan, is controlled by the newly organized Yankee Mines Co. About 90,000 tons of milling ore containing zinc and lead is the estimated reserve in these properties, and the new company plans to treat the ore in its concentration mill at the mine. The Pacific or Blue Rock mine produced 338 tons of lead-silver ore, which brought $27,270.55 at the smelter. Freight and transportation was $2,672.68. Mill ore amounting to 5,333 tons was placed on the dump preparatory to starting the concentrator at the mine. Other producers of lead-silver ore were the Red Cloud and Mary Ellen properties. The freight rate on ore from American Fork to the smelters was $1.30 a ton on most of the ore, and haulage from the mine to the railroad cost $7 to $8 a ton.

Mine production of gold, silver, copper, and lead in American Fork district, Utah, in 1925

	Number of producers	Ore and slag	Gold	Silver	Copper	Lead	Zinc	Total value
		Short tons		*Fine ounces*	*Pounds*	*Pounds*	*Pounds*	
1925	6	13,374	$66,236	27,565	234,495	339,433	----------	$148,195
Increase or decrease from 1924	−1	+1,413	+55,191	+12,037	+157,825	−38,909	−72,957	+81,693
Total, 1870–1925	-------	84,246	392,454	1,984,135	677,482	31,012,403	240,722	4,363,687

[1] Includes 58 tons of slag.

Provo district.—Twelve tons of lead ore were shipped from the Squaw Peak claims in Rock Canyon.

Santaquin district.—One lot of rich lead ore was shipped from the Union Chief property.

Tintic district.—From the Utah County side of the Tintic district the mines of Tintic Standard, Apex Standard, Colorado, Iron King, May Day, Uncle Sam, Yankee, and Zuma companies produced considerable ore, which is included in the total district output given under Juab County.

WASHINGTON COUNTY

Tutsagubet district.—Lessees developed some oxidized copper ore and sulphide lead ore in the Apex mine of the Utah Southern Mining Co. This ore was hauled 55 miles to Cedar City and shipped to Salt Lake City on the Union Pacific Railroad.

SUMMARY OF MINERAL PRODUCTION IN FOREIGN COUNTRIES, 1920–1924

By L. M. Jones

INTRODUCTION

As almost all industries of to-day depend in some degree on other than domestic sources for one or more of the raw materials necessary to their well-being, it is desirable that the mineral operators of the United States should have a working knowledge of the sources of supply, the potentialities, actual conditions, and trend of the mineral industry in other countries. In order to aid the dissemination of useful facts, the following summary of the mineral production of foreign countries for the five-year period 1920 to 1924 has been prepared.

For some countries no data of actual output are available, and the exports of mineral products have been given as an indication of a country's mineral possibilities; for others, where neither production nor exports could be ascertained, a brief résumé of the reputed mineral deposits has been given.

It is unavoidable that for some countries and commodities the figures given in the following summary tables differ somewhat from those in the world tables for individual minerals published in other chapters of the complete volume, "Mineral Resources of the United States." Those chapters were published earlier and include the best figures available at the time of publication, whereas the differing data in the summary represent revised figures as published in the final annual reports of the various countries, issued after publication of the chapters in question.

The quantities are given in metric units, the figures as reported having been converted by the use of the factors listed below. As a rule, the metric equivalents corresponding most nearly to the original units have been used—for example, pounds have been converted to kilograms.

1 ton (statute)	1.01605 metric tons.
1 ton (short)	0.90718 metric ton.
1 hundredweight (British)	0.05080208 metric ton or 50.80208 kilograms.
1 pound, avoirdupois	0.45359 kilogram.
1 ounce, troy	0.03110348 kilogram or 31.10348 grams.
1 gallon, imperial	0.045436 hectoliter or 4.5436 liters.
1 cubic foot	0.028317016 cubic meter.
1 bushel (lime)	0.0317513 metric ton.
1 pikol (Netherlands East Indies)	0.06168824 metric ton.
1 picul (China, Siam, Federated and Unfederated Malay States, Straits Settlements)	0.06047866 metric ton.

1 picul (Japan)	0.06 metric ton.
1 kin (Japan)	0.0006 metric ton or 0.6 kilogram.
1 kwan (Japan)	0.00375 metric ton or 3.75 kilograms.
1 momme (Japan)	3.75 grams.
1 koku (Japan)	1.80391 hectoliters.
1 cubic shaku (Japan)	0.02783 cubic meter.

ABYSSINIA [1]

Extensive deposits of coal, copper, gold, phosphate rock, potash, rock salt, and sulphur are known in Abyssinia, and deposits of asbestos, feldspar, iron, lead, limestone, marble, mica, mercury, petroleum, platinum, silver-lead, tin, and tungsten are also reported; but with the exception of potash none of these minerals have been commercially exploited.

An enormous deposit of potash in the Asal salt plain, close to the border of Eritrea, was worked by an Italian company during the World War. The reserves are estimated at 1,000,000 tons.[2] Production was largest in 1917, when 3,578 tons were exported. The mines have not been worked for several years.

Drilling for oil has been done in the Gildessa district, but so far as known the results have not been encouraging.

Placer gold, tin, and salt are mined in a small way by natives, but data of production are not available.

ADEN

No mineral deposits are known in Aden, and the production of salt by the evaporation of sea water is the only mineral industry of the country. Exports of salt are reported as follows for the years ended March 31 of the year following that stated:[3] 1920, 174,560 tons; 1921, 153,272 tons; 1922, 183,290 tons; 1923, 194,183 tons; 1924, 208,223 tons.

AFGHANISTAN [4]

Although attempts to mine the ores and gem stones of Afghanistan date back to remote antiquity, the mineral industry of the country remains commercially undeveloped. No data of mineral production are available.

Workable deposits of asbestos, coal, copper, gem stones (rubies and lapis lazuli), gold, iron, lead, mica, oil shale, petroleum, pyrites (copper and iron), rock salt, silver-lead, and sulphur are known. The lapis lazuli of Badakshán has long been in high repute. A gold mine near Kandahar is worked under British supervision and natives work placers crudely at various localities. Except for these minor industries no mining is known.

ALBANIA

Albania [5] has never been thoroughly prospected, but present knowledge leads to the belief that it has considerable mineral wealth.

---

[1] Information supplied by A. E. Southard, United States consul, Aden, Arabia, 1920, and C. M. P. Cross, American consul, Aden, 1922.

[2] Nourse, M. R., Potash in 1920: U. S. Geol. Survey, Mineral Resources of the United States, 1920, pt. 2, p. 117, 1921.

[3] Publications, Imp. Min. Res. Bur., London.

[4] Herbordt, O., "Ueber nutzbare Lagerstätten in Afghanistan:" Ztschr. prakt. Geol., Jahrg. 33, 1925, pp. 193–198. Ferrari, Antonio, "Spedizione mineraria italiana nell' Afghanistan settentrionale:" La Miniera Italiana, vol. 7, 1923, pp. 100–107.

[5] Nowack, E., "Die nutzbaren Mineralvorkommen Albaniens:" Montan. Rundschau, Jahrg. 16, 1924, pp. 695–697.

The country may be roughly divided into two mineral zones, the northern and southern, of which the former is much the more important. Lack of transportation seriously hampers exploitation of the mineral deposits, however, and no data of output are available. The economic minerals known to occur in more or less workable quantities are arsenic (realgar and orpiment), asbestos, asphalt, chromite, coal, copper, gypsum, iron, manganiferous iron ore, natural gas, petroleum, and pyrite.

A large deposit of asbestos has been located near Korça, and a rich asphalt mine near Valona has been worked many years. Coal is reported from numerous localities, but generally speaking valuable deposits are few. The coastal area gives promising indications of rich deposits of petroleum. Large beds of gypsum are widely distributed. The deposits of pyrite, also, are rich and extensive.

ALGERIA

Mineral production of Algeria, 1920–1924 [1]

Mineral	1920	1921	1922	1923	1924
Abrasives: Diatomaceous earth—tons	1,500	800	2,480	10,000	10,000
Antimony ore [2]—do	1,894	10	----------	3,610	2,450
Barite—do	----------	----------	1,200	700	500
Briquets, fuel—do	30,866	32,799	27,052	31,234	78,924
Cement—do	47,575	30,945	31,400	39,865	39,329
Clay:					
Fire clay—do	3,000	2,000	----------	2,000	----------
Other clay—do	93,880	97,920	120,059	171,980	179,605
Coal:					
Bituminous—do	5,997	9,290	8,857	3,562	9,228
Lignite—do	1,796	251	----------	----------	----------
Coke, gas house—do	29,185	12,059	32,933	38,933	[3]
Coke by-products:					
Ammonium sulphate—do	186	199	299	300	[3]
Tar, crude—do	2,565	2,100	3,089	3,000	[3]
Copper ore [4]—do	687	1,720	2,320	2,687	3,110
Gypsum:					
Alabaster—do	----------	----------	70	87	100
Other—do	24,744	33,540	44,785	49,340	54,374
Iron ore [5]—do	1,071,278	720,840	1,045,816	1,452,563	1,662,506
Kaolin—do	360	300	1,500	1,018	1,260
Lead arsenate [6]—do	----------	----------	160	2,270	7,001
Lead ore [7]—do	11,633	9,733	13,840	14,516	15,986
Lime:					
Hydraulic—do	50,852	41,370	66,890	101,463	94,838
Other—do	----------	22,500	24,300	27,650	[3]
Petroleum, crude—do	604	418	1,382	1,337	1,737
Phosphate rock—do	502,614	398,800	484,304	467,384	681,136
Pyrite, iron—do	8,294	18,891	7,446	21,000	17,870
Quicksilver:					
Ore—do	----------	----------	----------	----------	1,120
Metallic—kilograms	----------	----------	----------	----------	2,729
Salt—tons	28,169	18,255	20,208	25,079	23,541
Sand and gravel—do	18,700	28,000	32,000	38,500	41,000
Stone:					
Building stone, dressed—do	13,700	21,600	19,480	19,000	17,150
Limestone for agriculture—do	4,414	4,100	8,720	12,650	14,950
Marble—do	270	270	395	668	685
Other stone—do	861,508	1,502,058	1,981,388	2,084,714	1,733,640
Sulphur—do	89	----------	----------	70	----------
Zinc ore [8]—do	26,562	14,550	31,439	49,331	42,759

[1] Statistique de l'industrie minérale et des appareils à vapeur en France et en Algérie; data furnished by the Direction des Mines, Algeria.

[2] Average antimony content reported as follows: 1920, no data; 1921, 35 per cent; 1922, no data; 1923, 42 per cent; 1924, 40 per cent.

[3] Data not available.

[4] Average copper content reported as follows: 1920, 10 per cent; 1921, 17 per cent; 1922, 18.5 per cent; 1923, 17 per cent; 1924, 18 per cent. Contains also some zinc and lead.

[5] Figures as reported by Direction des Mines, Algeria; figures given in Statistique de l'ind. min., Paris, are as follows: 1920, 1,059,820 tons; 1921, 707,043 tons; 1922, 1,018,725 tons; 1923, 1,452,563 tons.

[6] Average content reported as follows: 1922, Pb 23 per cent, As 21 per cent; 1923, Pb 21 per cent, As 18 per cent; 1924, Pb 20 per cent, As 22 per cent.

[7] Average lead content reported as follows: 1920, 60 per cent; 1921, 55 per cent; 1922, 62 per cent; 1923, 56 per cent; 1924, 54 per cent.

[8] Average zinc content reported as follows: 1920, 42 per cent; 1921, 46 per cent; 1922, 45 per cent; 1923, 41 per cent; 1924, 41.7 per cent.

ANGAUR ISLAND (JAPANESE OCEANIA)

The mining of phosphate rock is the only mineral industry of Angaur Island, now a part of the Japanese mandate territory of Oceania. The production in the years 1920 to 1924 is reported as follows:[6] 1920, 30,500 tons; 1921, 30,500 tons; 1922, 46,204 tons; 1923, 61,243 tons; 1924, 61,000 tons. The figures for 1920, 1921, and 1924 are approximate only, as exact returns for these years are not available.

ARABIA

Arabia has no mines and virtually no mineral industry. Deposits of coal, copper, gold, lead, mica, potash, salt, soda, and sulphur are known,[7] but evidently are not large enough or rich enough to encourage efforts to overcome the serious handicaps to exploitation.

ARGENTINA

Mineral production of Argentina, 1920–1924 [a]

Mineral	1920	1921	1922	1923	1924
Alum tons	58	41	61	2	
Antimony ore do	90		[b] 5	55	499
Asbestos kilograms	100			4,000	
Asphalt tons	538		205		
Bismuth ores kilograms		2,800	12,784	3,000	11,270
Borates tons	3,421	2,872	1,477	1,958	2,807
Calcium carbonate do			108		
Clay:					
Kaolin do			317	118	47
Other clay do	35			12	
Coal [c] do	(c)	(c)	(c)	(c)	(c)
Copper ore do	321	1,271	773	479	451
Copper sulphate do	168				
Gold, fine [d] kilograms	150	113	112	120	120
Gypsum tons	[e] 125,088	20,486	20,581	32,552	32,014
Lead ore do	5,624	9,624	9,915	12,215	16,046
Lime do	(e)	94,652	97,582	143,001	180,057
Mica kilograms	65,360	7,080	8,000	37,000	4,510
Petroleum [f] tons	241,572	297,823	419,146	497,246	676,611
Potassium carbonate kilograms	16,900				
Quartz tons	506	793	365	2,147	2,236
Salt do	82,464	75,968	93,698	110,701	122,432
Sand do	13,384	21,103	24,250	32,025	36,802
Silver, fine [d] kilograms	622	778	777		
Sodium sulphate tons	1,930	1,033	265	564	863
Stone:					
Limestone do	121,015	85,031	90,482	128,059	118,929
Marble do	127	2	2		
Other stone do	710,804	321,656	389,506	540,309	882,866
Sulphur kilograms			3,190		
Talc do	20,000				
Tin ores do	5,500	4,590		3,000	
Tungsten ore: Wolfram do	11,640	45,929	121,418	4,000	
Vanadium ore do	[b] 118,877	526,804			

[a] Data furnished by the Dirección general de Minas, Geología é Hidrología, Buenos Aires; Memoria de la Dirección general de yacimientos petrolíf. fiscales, 1923. Statistics relate to railway shipments except where otherwise noted.
[b] Exports.
[c] Annual production, including lignite, estimated to be approximately 5,000 tons.
[d] Figures as published by the Director of the U. S. Mint.
[e] Lime included with gypsum.
[f] Production.

[6] Publications, Imp. Min. Res. Bur., London.
[7] Information supplied by A. E. Southard, United States consul, Aden, 1920.

AUSTRALIA

Mineral production of the Commonwealth of Australia, 1920–1924 [1]

Mineral	1920	1921	1922	1923	1924
Abrasives:					
Corundum (exports)—kilograms		25			
Diatomaceous earth—tons	1,406	209	489	523	573
Alunite—do	664	543	285	1,014	1,024
Amblygonite—do					46
Antimony, ores and concentrates—do	1,182	580	1,304	835	280
Arsenic, white—do	381	627	702	2,023	1,338
Asbestos—do	839	1,201	755	331	79
Barite—do	3,874	1,492	1,927	1,891	2,080
Bismuth, ore and concentrates [2]—do	77	8	5	6	15
Cadmium—kilograms			36,577	124,972	161,885
Cement—barrels	146,196	157,776	190,814	227,445	298,034
Chromite, crude—do	1,644	63	537	1,211	785
Clay:					
Fire—do	8,132	9,917	8,146	14,999	14,295
Kaolin—do	5,701	3,752	6,476	6,034	4,906
Other clay [3]—do	84,440	41,558	33,670	54,554	103,368
Coal:					
Bituminous—do	13,011,133	13,003,715	12,404,565	12,718,335	13,978,368
Lignite—do	165,293	80,496	91,853	118,764	129,536
Cobalt, ore and concentrates—do		86	104	221	200
Coke, metallurgical [4]—do	596,646	609,012	249,473	595,019	580,650
Copper [5]—kilograms	27,021,850	11,147,085	12,702,657	17,997,294	14,806,897
Feldspar—tons	4	26	86	33	15
Fluorspar—do	1,839	744			2,372
Fuller's earth—do	14		51	51	51
Gems:					
Diamonds—carats	3,523	1,563	1,000	175	284
Opals [6]	($178,162)	($80,951)	($93,674)	($32,209)	($64,543)
Other gem stones [6]	($251,398)	($195,277)	($169,152)	($121,654)	($130,826)
Gold, fine—grams	29,339,914	23,573,484	23,500,048	22,166,300	21,009,096
Graphite—tons	54		[7] 51		3
Gypsum—do	44,284	47,233	54,806	69,331	87,239
Iron:					
Ore—do	605,513	701,095	167,400	572,118	737,415
Pig iron [8]—do	349,521	358,020	84,874	335,096	422,728
Lead [5]—do	14,590	85,224	154,367	174,615	156,608
Lime [4]—do	34,043	34,160	33,787	41,322	38,187
Magnesite—do	6,919	12,770	4,108	6,474	13,056
Manganese ore—do	3,109	6,065	3,323	2,865	4,838
Mica—kilograms	709	897	3,582	2,685	3,112
Mineral paint ores—tons	1,877	1,004	612	371	1,568
Molybdenite—do	119	14	655	71	57
Oil shale—do	21,483	33,892	23,885	2,345	2,253
Pebbles, flint—do	430	433	753	478	396
Phosphate rock—do	13,339	7,305	3,951	1,016	735
Platinum metals:					
Osmiridium—grams	62,487	54,462	36,515	20,933	11,353
Platinum—do	24,758	7,745	2,488	18,227	20,093
Pyrite, iron—tons	10,628	6,832	11,905	12,073	
Quartz—do	992				
Salt [9]—do	72,008	57,399	49,438	51,093	63,693
Silica—do	15,123	19,212	3,599	18,922	32,468
Silver, fine [10]—kilograms	21,193	142,232	245,596	237,808	237,357
Silver-lead ore and concentrates [11]—tons	9,127	54,366	202,788	245,643	245,025
Slate—do	[12]		61	6	[12]

[1] Compiled from the annual reports of the mines departments of the respective Australian States, except as otherwise noted. The lack of uniformity in the methods of reporting mineral statistics in the several States renders the task of combining the figures somewhat difficult and in some cases virtually impossible.

[2] Exclusive of the output of Queensland, for which only the metal content of the ores is reported.

[3] Includes some fire clay from South Australia, for which separate data are not available.

[4] Returns from New South Wales and Queensland.

[5] Figures of the Australian Mines and Metals Association, Melbourne, representing estimated metal content of ores mined in the Commonwealth.

[6] Quantity not reported. Values have been converted from pounds sterling at the annual average rates of exchange for Australia as compiled in the financial and investment division, U. S. Bureau Foreign and Domestic Commerce.

[7] Exclusive of a small quantity exported from Western Australia, for which value only is reported.

[8] Figures of the Australian Mines and Metals Association.

[9] Returns from South Australia only.

[10] Figures of the Australian Mines and Metals Association, representing refined silver recovered in the Commonwealth by mints and smelters. In addition, the association estimates the fine silver content of bullion produced and of ores and concentrates exported as follows: 1920, 20,646 kilos; 1921, 22,770 kilos; 1922, 119,756 kilos; 1923, 158,950 kilos; 1924, 69,739 kilos.

[11] Exclusive of the output of Tasmania, for which value only is reported.

[12] Weight not reported. Production of roofing slates reported as follows: 1920, 200,000 slates; 1924, 53,434 slates.

Mineral production of the Commonwealth of Australia, 1920–1924—Continued

Mineral	1920	1921	1922	1923	1924
Stone:					
Granite tons	633	635	484	268	547
Limestone do	515,270	501,074	669,093	814,518	917,836
Marble do	1,072	858	601	362	306
Other stone do	15,046	9,068	2,402	11,306	33,131
Talc and soapstone do	415	323	475	632	873
Tantalite (exports) do				5	
Tin [5] do	5,317	3,650	2,611	3,336	3,118
Tungsten ores:					
Scheelite do	312				
Wolfram do	444	15	39	101	65
Whiting do	10				
Zinc [5] do	10,238	141,698	198,671	145,513	109,895

[5] Figures of the Australian Mines and Metals Association, Melbourne, representing estimated metal content of ores mined in the Commonwealth.

Mineral production of New South Wales, 1920–1924 [1]

Mineral	1920	1921	1922	1923	1924
Abrasives: Diatomaceous earth tons	390	209	489	523	573
Alunite do	644	528	188	1,014	1,024
Antimony ore do	203	127			
Arsenic:					
Ore and concentrates do	[2]	1,117	[2]	11,677	4,487
White arsenic do	71	403	296	367	328
Asbestos do	675	960	570	207	
Barite do	226	203		102	152
Bismuth ores and concentrates do	77	8	5	6	15
Cement, Portland do	146,196	157,776	190,814	227,445	276,670
Chromite do	1,483	63	537	1,211	785
Clay:					
Fire clay do	472	7,510	2,258	7,481	9,106
Kaolin do	2,833	1,576	4,099	3,690	3,137
Other clay do	84,397	41,378	32,163	54,519	102,925
Coal do	10,887,991	10,966,621	10,346,572	10,646,693	11,804,688
Coke, metallurgical do	576,678	601,600	244,085	589,689	573,420
Copper:					
Ore do	[2]	[2]	[2]	2,398	8,037
Metal [3] kilograms	1,332,042	507,009	654,336	913,429	1,147,120
Feldspar tons		25	25	13	15
Fluorspar do	1,213				478
Fuller's earth do	14		51	51	51
Gems:					
Diamonds carats	3,523	1,563	1,000	175	284
Opals [4]	($87,414)	($51,364)	($67,099)	($13,908)	($45,791)
Other gem stones grams	95,923	52,347	106,903	32,161	84,384
Gold, fine do	1,521,178	1,591,658	784,492	585,772	581,169
Graphite tons	41		51		
Gypsum do		304	1,719	2,103	2,709
Iron:					
Ore [5] do	165,820	181,839	115,152	181,309	147,793
Pig iron [6] do	87,478	91,498	55,736	95,864	75,264
Lead, pig [7] do	420	20,680	8,243		
Lime do	34,043	34,160	33,787	41,322	38,187
Magnesite do	6,578	12,465	3,424	6,228	12,697
Manganese ore do	2,572	3,571	2,436	2,597	4,457
Mineral paint ores (ocher, umber, etc.) tons	966	450	535	193	750
Molybdenite do	41		2	10	11
Oil shale do	21,341	33,010	23,844	1,226	652
Phosphate rock do	156	203	12	75	109
Platinum grams	24,758	7,745	2,488	18,227	20,093
Silica tons	15,123	19,212	3,599	18,922	32,468
Silver, fine kilograms	4,943	61,068	23,325	3,349	2,908
Silver-lead ores and concentrates [8] tons	9,033	54,366	202,788	245,641	244,824

[1] Ann. Rept., Dept. Mines, New South Wales, except as otherwise noted.
[2] Data not available.
[3] Figures of the Australian Mines and Metals Association, representing estimated copper content of ores mined in the State.
[4] Quantity not reported. (See footnote 6 under the Commonwealth.)
[5] Includes iron oxide used for paint and ironstone used for flux.
[6] Made from ores mined in the State.
[7] Produced in the State from ores mined in the State.
[8] Estimated metal content of silver-lead ores mined in New South Wales, treated within the Commonwealth of Australia or exported, is as follows: 1920—lead, 4,851 tons; zinc, 32,826 tons; silver, 21,005 kilos; 1921—lead, 54,831 tons; zinc, 21,029 tons; silver, 131,938 kilos; 1922—cadmium, 36,577 kilos; lead, 119,076 tons; zinc, 158,412 tons; silver, 308,327 kilos; 1923—cadmium, 124,972 kilos; copper, 913 tons; lead, 168,132 tons; zinc, 193,529 tons; silver, 375,355 kilos; 1924—cadmium, 152,152 kilos; copper, 634 tons; lead, 144,170 tons; zinc, 160,488 tons; silver, 287,915 kilos.

Mineral production of New South Wales, 1920–1924—Continued

Mineral	1920	1921	1922	1923	1924
Slate—tons	(9)		61	6	(9)
Stone:					
Granite—do	633	635	484	268	547
Limestone—do	377,518	391,795	518,282	520,584	559,844
Marble—do	642	478	286	229	219
Other stone—do	15,046	9,068	2,402	11,306	33,131
Talc and soapstone—do	214	61	203	207	543
Tin, ingots—do	901	829	746	910	1,058
Tungsten ores:					
Scheelite—do	21				
Wolfram—do	14			2	9
Zinc concentrates—do	72,183	80,973	369,518	432,887	359,326

9 Weight not reported. Production of roofing slates reported as follows: 1920, 200,000 slates; 1924, 53,434 slates.

Mineral production of Northern Territory, 1920–1924 [1]

Mineral	1920	1921	1922	1923	1924
Amblygonite—tons					45
Bismuth ore—kilograms	127				
Copper ore [2]—tons		41	22	25	9
Gold, fine—grams	18,227	4,510	5,879	17,294	6,967
Graphite—tons					3
Mica—kilograms	353	897	1,474	2,685	3,112
Molybdenite—do				64	
Silver lead ore—tons	11				[3] 194
Tin concentrates [4]—do	100	84	108	124	91
Tungsten ore: Wolfram—do	217		16	(5)	

1 Data furnished by the Director of Mines, Northern Territory.
2 Copper content reported as 30 to 35 per cent in 1921; similar data not available for other years.
3 Reported to contain zinc also in payable quantities.
4 In 1920 and 1921 tin content reported as 63 to 64 per cent; similar data not available for other years.
5 Less than 1 ton (432 kilograms).

Mineral production of Queensland, 1920–1924 [1]

Mineral	1920	1921	1922	1923	1924
Arsenic, white—tons	310	224	406	620	572
Bismuth [2]—kilograms	965	76	1,829	254	254
Chromite—tons	161				
Clay, fire—do	7,660	1,718	5,888	7,518	5,189
Coal—do	1,127,727	970,087	973,903	1,077,686	1,141,143
Cobalt ore and concentrates—do		86	104	221	200
Coke, metallurgical [3]—do	19,968	7,412	5,388	5,330	7,230
Copper [2]—kilograms	16,152,147	2,466,969	5,185,919	6,343,200	5,720,362
Fluorspar—tons	613	545			1,894
Gems:					
Opal [4]	($1,852)	($1,972)	($2,215)	($2,288)	($1,308)
Other gem stones [4]	($243,838)	($183,537)	($156,618)	($106,639)	($106,147)
Gold, fine—grams	3,584,054	1,255,834	2,506,443	2,759,687	3,074,299
Ironstone for flux—tons	20,025	4,126		203	
Lead [2]—do	1,736	1,074	2,842	5,575	3,754
Magnesite—do					151
Manganese ore—do	15	846	68	75	
Mica—kilograms			76		
Molybdenite—tons	29	9	1	10	3
Phosphate rock—do		375	66		
Quartz—do	992				
Silver, fine—kilograms	8,530	6,075	8,492	14,597	8,605
Stone:					
Limestone—tons	106,754	64,291	79,441	96,685	98,454
Marble—do	430	380	315	133	87
Tin concentrates—do	1,510	1,067	1,116	917	1,215
Tungsten ores:					
Scheelite—do	3				
Wolfram [5]—do	132	5	4		1
Whiting—do	10				
Zinc [2]—do					130

1 Ann. Rept., Under Secretary for Mines, Queensland, except as otherwise noted.
2 Estimated content of ores and concentrates.
3 Figures as published by Imp. Min. Res. Bur., London.
4 Quantity not reported. (See footnote 6 under the Commonwealth.)
5 Includes bismuth-wolfram ores.

Mineral production of South Australia, 1920–1924 [1]

Mineral	1920	1921	1922	1923	1924
Alunite—tons	20	15	97		
Arsenic ore—do					69
Asbestos—do	5	2		7	4
Barite—do	2,583	1,289	1,908	1,789	1,928
Clay:					
Kaolin—do	704				
Other clay—do	43	176	1,506		443
Copper [2]—kilograms	4,408,641	1,556,589	1,204,019	3,579,544	411,500
Feldspar—tons	4			20	
Gems: Opal [3]	($88,896)	($27,615)	($24,360)	($16,013)	($17,444)
Gold, fine—grams	52,783	81,740	31,103	29,548	27,371
Gypsum—tons	40,837	34,935	45,967	54,262	66,744
Ironstone—do	419,667	515,130	52,248	390,604	589,622
Magnesite—do	188	175	585	168	131
Manganese ore—do	522	1,622	649	171	321
Mineral paint ores: Ocher—do	264	200	77	53	721
Pebbles, flint—do	430	433	753	478	396
Phosphate rock—do	8,893	5,161	2,759	453	85
Salt—do	72,008	57,399	49,438	51,093	63,693
Silver—kilograms	31	45	78	1	32
Silver-lead ore—tons	83			2	7
Stone: Limestone—do	30,998	44,988	71,370	95,529	111,052
Talc and soapstone—do	201	262	272	425	330

[1] Mining Review, Department Mines, South Australia.
[2] Estimated copper content of ores and concentrates produced in the State.
[3] Quantity not reported. (See footnote 6 under the Commonwealth.)

Mineral production of Tasmania, 1920–1924 [1]

Mineral	1920	1921	1922	1923	1924
Barite—tons	1,065				
Bismuth—kilograms	102	51			
Cadmium [2]—do					5,331
Cement—tons					21,364
Coal—do	76,640	67,543	70,349	82,014	77,208
Copper [3]—kilograms	4,868,912	6,280,205	5,706,137	6,162,343	6,805,503
Gold, fine—grams	194,272	166,093	106,716	114,585	143,885
Lead [4]—tons	3,918	1,458	5,005	4,861	4,632
Mineral paint ores: Ocher—do		14			20
Oil shale—do	142	882	41	1,119	1,601
Osmiridium—grams	62,487	54,462	36,515	20,933	11,353
Pyrite, iron—tons	4,511	617	8,409	12,073	
Silver, fine [5]—kilograms	19,389	10,844	24,714	19,863	19,973
Silver-lead ore [6]	($967,359)	($234,420)	($988,478)	($920,874)	($1,004,247)
Stone: Limestone—tons				101,720	148,486
Tin, metallic—do	1,331	803	690	1,179	1,126
Tungsten ores:					
Scheelite—do	107				
Wolfram—do	72	10	19	99	55
Zinc [7]—do	9				2,793

[1] Report of the Secretary for Mines, Tasmania.
[2] Produced from Tasmanian ores. In addition, the following quantities of cadmium were extracted from other than Tasmanian ores: 1922, 36,577 kilos; 1923, 124,972 kilos; 1924, 156,554 kilos.
[3] Estimated copper content of copper ore and blister copper produced in Tasmania, distributed as follows: 1920, 4,868 tons in blister, 1 ton in ore; 1921, 6,270 tons in blister, 10 tons in ore; 1922, 5,706 tons in blister; 1923, 6,160 tons in blister, 2 tons in ore; 1924, 6,806 tons in blister.
[4] Estimated lead content of silver-lead ores mined in the State.
[5] Estimated silver content of silver-lead ores and blister copper produced in the State, distributed as follows: 1920, in ores, 14,103 kilos, in blister copper, 5,286 kilos; 1921, in ores, 5,152 kilos, in blister copper, 5,692 kilos; 1922, in ores, 20,991 kilos, in blister copper, 3,723 kilos; 1923, in ores, 16,052 kilos, in blister copper, 3,811 kilos; 1924, in ores, 15,389 kilos, in blister copper, 4,584 kilos.
[6] Quantity not stated. (See footnote 6 under the Commonwealth.)
[7] Slab zinc from ores mined in the State. In addition, the following quantities of slab zinc were made from other than Tasmanian ores: 1920, 5,893 tons; 1921, 1,136 tons; 1922, 23,894 tons; 1923, 41,814 tons; 1924, 44,630 tons.

Mineral production of Victoria, 1920–1924 [1]

Mineral	1920	1921	1922	1923	1924
Abrasives: Diatomaceous earth ---- tons	1,016				
Antimony concentrates [2] ---- do	976	353	1,304	835	280
Arsenic, white ---- do	([3])	([3])	([3])	[4] 1,086	[4] 437
Clay: Kaolin ---- do	2,164	2,176	2,377	2,344	1,769
Coal					
Bituminous ---- do	449,339	523,122	568,261	484,476	526,634
Lignite ---- do	165,293	80,496	91,853	118,764	129,536
Fluorspar ---- do	13	199			
Gold, fine ---- grams	4,752,363	3,250,687	3,324,091	2,967,365	2,089,128
Gypsum ---- tons	3,447	11,318	7,056	12,966	13,481
Magnesite ---- do	153	130	99	76	77
Manganese ore ---- do		10	152		
Mineral paint ores: Ocher, etc ---- do	647	340		125	77
Molybdenite ---- do	49	5	600	51	43
Phosphate rock ---- do	4,290	1,566	1,114	488	541
Silver, fine [5] ---- kilograms	194	162	217	196	131
Tin concentrates ---- tons	85	81	217	79	39
Tungsten ore: Wolfram ---- do	8				

[1] Gold and mineral statistics, Department of Mines, Victoria, and data furnished by the Secretary for Mines, Victoria, except as otherwise noted.
[2] Average antimony content reported as follows for 1922–1924: 1922 and 1924, 58 per cent; 1923, 63 per cent. Similar data not available for 1920 and 1921.
[3] Data not available.
[4] Data furnished by the United States Trade Commissioner, Melbourne, Feb. 21, 1925.
[5] Extracted from gold at the Melbourne mint.

Mineral production of Western Australia, 1920–1924 [1]

[Exports] [1]

Mineral	1920	1921	1922	1923	1924
Abrasives: Corundum ---- kilograms		25			
Antimony concentrates ---- tons	3				
Arsenic ore ---- do	1,793	7	1,092	([2])	([2])
Asbestos [3] ---- do	159	239	185	117	75
Barite ---- kilograms		102	19,305		
Clay:					
Fire clay [3] ---- tons	689				
Other ---- do	([4])	4	1	35	
Coal [3] ---- do	469,436	476,342	445,480	427,466	428,635
Copper:					
Ore [3] ---- do	1,993	1,168	1,214	10,031	10,928
Metal [5] ---- kilograms	260,109	331,232	190,000	823,000	607,598
Feldspar ---- tons		1	61		
Gold, fine [6] ---- grams	19,217,037	17,222,962	16,741,324	15,692,049	15,086,277
Graphite ---- tons	13		([7])		
Gypsum [3] ---- do		676	64		4,305
Iron ores ---- do	1			2	
Lead:					
Ore [3] ---- do	28,161	10,496	30,078	21,982	37,340
Metal [5] ---- do	5,154	1,216	3,090	2,273	3,076
Magnesite ---- do				2	
Manganese ore ---- do		16	[3] 18	22	[3] 60
Mica ---- kilograms	356		2,032		
Molybdenite ---- do	508		51,818		
Pyrite [3] ---- tons	6,117	6,215	3,496		
Silver, fine ---- kilograms	4,065	3,613	3,692	3,390	2,773
Tantalite ---- tons				5	
Tin concentrates ---- do	247	68	112	133	88
Tungsten ores: Scheelite [3] ---- do	181				

[1] Report of the Department of Mines, Western Australia. Data relate to exports of domestic produce, except as otherwise noted.
[2] Data not available. Value of exports of arsenic contained in gold ore reported as follows: 1923, $3,138; 1924, $3,388. (See footnote 6 under the Commonwealth.)
[3] Production.
[4] Less than 1 ton (304 kilograms).
[5] Estimated metal content of ores produced in the State.
[6] Exported and minted.
[7] Quantity not stated, value of exports reported as $13. (See footnote 6 under the Commonwealth.)

AUSTRIA

Mineral production of Austria, 1920–1924[1]

Mineral	1920	1921	1922	1923	1924
Antimony ore [2]—tons			1,660	776	8
Arsenic, white [3]—do	7	38	103	136	25(
Barite—do		2,080	2,140	2,377	1,39
Bauxite—do	362	2,638	4,095	2,734	
Coal:					
Bituminous—do	132,864	137,633	165,727	157,650	171,95
Lignite—do	2,696,954	2,797,077	3,135,902	2,685,467	2,785,81
Copper:					
Ore [4]—do	26,410	23,980	41,927	67,986	84,59
Metal [5]—do	1,645	4,277	4,593	4,833	3,84
Gold ores [6]—do		1,210	5,288	3,859	5,62
Gold, fine [7]—kilograms		5	17	23	61
Graphite—tons	11,543	13,280	14,034	9,403	9,52
Gypsum—do	(8)	(8)	(8)	[9] 60,000	[9] 60,00
Iron:					
Ore [10]—do	435,062	710,932	1,112,415	1,211,065	713,80
Pig iron—do	99,766	224,031	320,928	341,875	266,46
Lead:					
Concentrates [11]—do	6,014	4,334	844	6,682	6,57
Metal [5]—do	3,973	3,347	3,360	4,255	4,98
Magnesia, caustic (exports)—do	7,126	8,255	12,635	5,341	6,43
Magnesite:					
Crude (exports)—do	10,204	6,512	(8)	2,249	1,63
Sintered (exports)—do	53,237	73,503	133,927	84,782	73,92
Mineral paint ores:					
Iron oxide—do	221	821	1,332	474	46
Ocher, etc—do	278	583	870	644	66
Oil shale, ichthyolic—do	1,095	1,160	715	424	37
Pyrite:					
Arsenical—do					56
Cupreous-iron—do	22,764	23,142	19,400	15,136	28,04
Salt:					
Rock—do	2,455	1,815	2,328	1,520	2,74
Brine [12]—do	116,482	126,754	142,072	81,771	108,42
Silver, fine [7]—kilograms	435	327	267	441	89
Talc (exports)—tons	6,894	8,013	13,480	7,489	9,58
Zinc concentrates [13]—do	1,125	103	30	1,168	1,22

[1] Mitteilungen über den österr. Bergbau; Statistik des auswärt. Handels Oesterreichs, except as otherwise noted.

[2] Estimated antimony content of ores reported as follows: 1922, 1,747 quintals; 1923, 776 quintals; 1924, 8 quintals.

[3] Estimated content of slimes in 1920 and of ores in other years.

[4] Estimated copper content reported as follows: 1920, 677 tons; 1921, 612 tons; 1922, 1,121 tons; 1923, 1,611 tons; 1924, 1,748 tons, exclusive of content of 1,000 tons of ore from lower Austria, for which the content was not stated.

[5] Smelter output.

[6] Data relate to arsenical ores mined primarily for their gold and silver content, which is reported as follows: 1921, gold 6 kilos, silver 33 kilos; 1922, gold 29.4 kilos, silver 145.3 kilos, exclusive of 617 tons of ore from Carinthia, for which the content was not reported; 1923, gold 32.7 kilos, silver 187.6 kilos; 1924, gold 67.23 kilos, silver 285.69 kilos.

[7] Figures of production as published by the Director U. S. Mint.

[8] Data not available.

[9] Official estimate of annual output.

[10] Manganese content reported as follows: 1920, 9,409 tons; 1921, 13,345 tons; 1922, 19,947 tons; 1923, 24,033 tons; 1924, 15,007 tons.

[11] Estimated lead content reported as follows: 1920, 3,846 tons; 1921, 2,799 tons; 1922, 452 tons; 1923, 4,500 tons; 1924, 4,507 tons.

[12] Salt content of brine.

[13] Estimated zinc content reported as follows: 1920, 434 tons; 1921, 40 tons; 1922, 12 tons; 1923, 472 tons; 1924, 488 tons.

BASUTOLAND

Mining in Basutoland is virtually nonexistent. Indications of copper and iron have been reported, and coal has been found and used locally,[8] but there have been no developments worthy of note.

BECHUANALAND PROTECTORATE

Little is known of the mineral resources of the Bechuanaland Protectorate. Deposits of coal, copper, gold, iron, and silver are known, but only the precious metals have been exploited commercially.[9] The production of these metals for the period under review appears below; the figures are for the year ended March 31 of the year following that stated:

Mineral production of Bechuanaland Protectorate, 1920–1924, in grams [1]

Metal	1920	1921	1922	1923	1924
Gold, fine	148,768	144,413	186,776	94,555	56,515
Silver, fine	14,899	21,959	40,963	20,559	11,166

[1] Publications of the Imp. Min. Res. Bur., London.

BELGIAN CONGO

Mineral production of the Belgian Congo, 1920–1924 [a]

Mineral	1920	1921	1922	1923	1924
Coal, tons	2,000	2,990	33,000	65,000	81,000
Cobalt alloy, do					976
Copper:					
Ore, do	164,502	(c)	1,001,550	1,307,027	1,564,958
Metal [b], do	18,962	30,464	43,362	57,886	85,570
Diamonds, carats	274,103	174,000	249,000	450,000	550,347
Gold, crude, kilograms	5,046	2,262	2,309	3,146	3,605
Iron ore, for flux, tons	79,732	73,215	71,305	105,756	105,195
Limestone, for flux, do	70,114	(c)	105,533	154,896	178,729
Tin concentrates [d], do	594	916	1,250	1,375	1,402
Uranium ore, do			(e)	•3,856	(c)

[a] Data furnished by the Ministère des Colonies, Belgium; Ann. Rept. Tanganyika Concessions (Ltd.), London.
[b] Smelter output.
[c] Data not available.
[d] Exports. Average tin content reported as 70 to 76 per cent.
[e] Radium element extracted, 48 grams. The reduction plant is situated at Oolen, Belgium.

[8] Statesman's Year Book, London.
[9] Information supplied by C. J. Pisar, American consul, Cape Town, 1923.

BELGIUM

Mineral production of Belgium, 1920–1924 [1]

Mineral	1920	1921	1922	1923	1924
Abrasives: Whetstones ..... number	67,800	77,550	68,930	207,950	140,970
Antimony, metallic [2] ..... tons					170
Arsenic, white [2] ..... do			1,008	1,380	1,850
Barite ..... do	15,240	17,050	1,480	6,770	20,490
Briquets, fuel ..... do	2,846,370	2,676,680	2,497,350	1,929,260	2,030,310
Cement ..... do	[3]	[3]	[3]	[3]	441,400
Chalk, white ..... cubic meters	488,290	335,810	610,780	851,270	733,650
Clay ..... tons	421,210	377,690	399,610	450,120	787,340
Coal ..... do	22,388,770	21,750,410	21,208,500	22,922,340	23,361,910
Coke, metallurgical ..... do	1,835,400	1,402,610	2,849,884	4,179,964	4,216,580
Coke by-products:					
Ammonium sulphate ..... do	[3]	[3]	37,200	52,902	54,500
Benzol ..... do	[3]	[3]	13,214	21,735	23,590
Tar ..... do	[3]	[3]	83,977	133,182	132,400
Copper:					
Black copper ..... do			6,305	6,680	8,100
Matte ..... do	[4] 7,150	[4] 5,236	109	4,590	7,970
Refined copper ..... do			982	1,230	830
Copper sulphate ..... do			884	3,000	5,800
Iron:					
Ore ..... do	17,260	59,490	71,250	117,090	154,970
Pig [5] ..... do	1,116,400	872,010	1,613,160	2,147,950	2,843,920
Kaolin and eurite ..... do	1,030	700	2,910	14,980	17,000
Lead:					
Work lead ..... do	16,040	29,750	6,734	14,580	19,630
Refined lead ..... do	[3]	[3]	43,574	51,100	58,320
Lime ..... cubic meters	1,069,660	962,380	1,550,890	2,112,720	[6] 2,157,650
Mineral paint ores: Ocher ..... tons	200	200	360	450	300
Nickel ..... do					1,490
Phosphate rock ..... do	133,040	55,040	56,840	23,270	26,250
Phosphatic chalk, crude ..... cubic meters	254,820	32,970	47,080	103,450	161,170
Sand:					
For glass manufacture ..... do	46,680	116,030	171,660	541,840	509,960
Other, including gravel ..... do	650,050	533,260	685,430	428,660	635,890
Silica:					
For pottery ..... do	10,220	8,670	7,040	5,460	37,250
Other ..... do	8,640	4,160	4,420	6,630	2,320
Silver [2] ..... kilograms	14,760	31,240	46,151	77,570	111,880
Slate, roofing slates ..... number	18,860,000	24,822,000	30,717,000	30,780,000	33,570,000
Steel, crude (ingots and castings) ..... tons	1,253,110	764,150	1,565,140	2,296,890	2,875,030
Stone:					
Building stone, dressed ..... cubic meters	114,730	113,431	118,079	140,210	132,978
Dolomite ..... do	82,000	57,150	102,200	101,180	119,900
Flagstones ..... square meters	9,480	24,070	30,040	35,160	34,090
Limestone for industrial uses ..... cubic meters	442,140	357,180	478,030	596,430	677,340
Marble ..... do	10,970	9,780	10,495	15,070	16,930
Paving stones ..... number	59,563,000	67,687,000	51,143,000	57,019,000	62,182,000
Rubble ..... cubic meters	2,815,430	2,426,690	2,113,570	3,134,230	3,430,936
Zinc:					
Ore (blende) ..... tons			26	36	850
Metal (crude zinc) ..... do	84,260	66,150	112,290	147,040	161,700

[1] Statistique des industries extractives et métallurgiques et des appareils à vapeur en Belgique.
[2] Produced in lead and copper smelters.
[3] Data not available.
[4] Estimated copper content of mattes produced.
[5] Includes ferro-alloys.
[6] Tons.

BERMUDA ISLANDS

Limestone is quarried for local use, and some lime is manufactured, but there is no other mineral industry in the Bermudas. No data of production are available.

BOLIVIA

Mineral production of Bolivia, 1920–1924, in kilograms [1]

[Exports]

Mineral	1920	1921	1922	1923	1924
Antimony ore	1,100,117	640,000	420,000	709,553	1,409,731
Asbestos		265			51
Bismuth:					
Ore	153,005	23,942	144,048	162,148	151,427
Concentrates	27,014	4,708	15,968	7,509	14,320
Bars	194,537		136,798	182,554	174,959
Residues	63,175		40,410	20,385	58,480
Copper:					
Ore	15,753,740	21,188,868	21,270,687	18,874,795	10,607,000
Concentrates	1,921,490	880,868	1,486,792	1,220,306	701,401
Bars	5,083			8,999	
Cement	53,228	200,906	178,283	201,578	207,406
Matte	1,000	92,175			
Sulphides	10,322,000	10,968,074	11,613,400	11,985,500	9,575,000
Gold, fine [2]	8	9	13	13	30
Iron ore	20,000			3,962	
Lead:					
Ore	4,384,858	4,785,714	6,095,830	8,982,704	14,813,906
Bars	35,510	2,505		3,026	264
Scoria					18,807,922
Mercury		72			
Silver, fine [2]	68,429	74,650	167,139	162,141	141,051
Silver:					
Ore	22,392,129	16,357,986	18,486,944	22,029,761	13,205,867
Concentrates	2,788				
Bars	274	21	35	335	203
Cement	124,853	225,009	197,860	297,510	178,842
Sulphides	111,248	135,759	907,051	131,638	161,392
Tin:					
Concentrates	46,942,323	31,750,281	53,480,709	50,422,266	53,430,925
Bars	109,781	60,864	750	2,995	4,642
Tungsten concentrates	707,556	160,536	7,606		436
Zinc ore	1,205,880			390,000	485,445

[1] Comercio especial de Bolivia. [2] Production. Figures of Director of U. S. Mint.

BRAZIL

Mineral production of Brazil, 1920–1924[1]

[Exports]

Mineral	1920	1921	1922	1923	1924
Agate—kilograms	32,957	71,799	104,294	112,260	153,787
Arsenic, white[2]—do			52,888	175,482	239,707
Asbestos—do	600				
Bort (carbonado)[3]	($67,929)	($34,307)	($50,049)	($50,194)	($67,767)
Coal[4]—tons	([5])	([5])	[6] 500,000	[7] 324,154	[7] 342,200
Crystal—kilograms	39,626	40,572	93,013	151,633	202,715
Gems:					
Diamonds[3]	($116,066)	($62,065)	($86,970)	($86,270)	($63,033)
Other gem stones[3]	($11,799)	($10,453)	($8,407)	($13,281)	($12,799)
Gold, fine[8]—kilograms	3,912	4,183	4,562	4,500	4,500
Graphite—do		286			50
Iron:					
Ore—do	17,100	6,400		350,000	
Pig iron—do	85,420	346,705		160,000	([5])
Lead ore—do	105,000				
Lime—do	31,770	9,380	16,717	15,000	25,820
Manganese ore—tons	453,737	275,694	340,706	235,831	159,229
Mica—kilograms	68,133	46,022	66,807	55,538	79,171
Monazite sand—do	1,153,080	332,093	115,414		
Refractory earths and clay—do				100,000	
Salt—do	11,490	820	29,590	152,390	171,705
Silver, fine[8]—do	933	1,026	800	890	890
Talc—do	1,000				120
Titanium ore (ilmenite)—do			113,020	290,400	
Zirconium sand—do	541,506	122,141	331,703	33,230	764,140

[1] Commercio exterior do Brasil, except as otherwise noted.
[2] Production as reported by the St. John del Rey Mining Co. was as follows: 1920, 127 tons; 1921, 127 tons; 1922, 154 tons; 1923, 162 tons; 1924, 146 tons.
[3] Quantity not reported. Values converted from milreis at the annual average rates of exchange, as compiled by the U. S. Federal Reserve Board.
[4] Production.
[5] Data not available.
[6] Official estimate.
[7] Data furnished by A. Gaulin, U. S. consul general, Rio de Janeiro.
[8] Production figures as published by the Director, U. S. Mint.

BRITISH BORNEO

Mineral production of British Borneo, 1920–1924[1]

Mineral and State	1920	1921	1922	1923	1924
Coal:					
Brunei—tons	28,558	27,289	18,983	19,639	10,503
North Borneo—do	66,579	84,199	88,959	63,676	90,847
Sarawak—do	10,844	13,251	7,913	([2])	19,263
Total—do	105,981	124,739	115,855	([2])	120,613
Gold, fine:[3] Sarawak—grams	508,635	531,590	34,121	[4] 67,588	[4] 26,687
Petroleum: Sarawak[5]—tons	146,730	203,066	409,867	567,255	599,422
Silver, fine:[3] Sarawak—kilograms	161	107	14		

[1] Figures published by the Imp. Min. Res. Bur., London, except as otherwise noted.
[2] Data not available.
[3] Estimated metal content of ores.
[4] Exports.
[5] Figures of the Royal Dutch Shell Co.

BRITISH EAST AFRICA

Kenya Colony.—Deposits of copper, diatomaceous earth, gold, graphite, manganese, mica, and soda are reported to exist in Kenya Colony, but the deposits are small and inaccessible and none has been exploited commercially so far as known, except the soda deposits of Lake Magadi, which are said to be extremely rich and are being

developed by the Magadi Soda Co.[10] Data of annual output are not available.

Tanganyika Territory.—See Tanganyika Territory (p. 507).

Uganda Protectorate.—The Geological Survey of Uganda [11] reports the economic mineral possibilities of Uganda, as follows: Arsenopyrite (mispickel), found in Ankole; asbestos, small quantity found in Ankole, but indications of marketable supplies not favorable; bauxite, deposits large, but lack of transportation impairs present value; chromite, not found in large quantities; coal, reported from two localities; copper, reported by the Italian geologist, Roccati, as plentiful on Mount Stanley; gold, widely distributed, but payable quantities not proved; graphite, deposits located, of good quality; iron, in abundant supply; kaolin, some remarkably grit-free deposits known; manganese, occurs in small quantities, widely distributed; mica, three chief varieties occur, but only muscovite found in large crystals; monazite, of wide distribution, but known in quantity at only two localities; petroleum, promising indications near Lake Albert, but transport facilities are poor; salt, alluvial deposits, largest producing centers at Kibero and Katwe; sand suitable for glass-making reported; talc, remarkable graphite-talc rock occurs in Ankole; tin, promising samples of cassiterite found in the Bukoba district near Ankole; zircon occurs widely but is abundant in only one area.

No data of mineral production are available.

Zanzibar and Pemba.—No mines are known. Some clay is dug for making pottery, but there is no other mineral production.

BRITISH GUIANA

Mineral production of British Guiana, 1920–1924 [1]

Mineral		1920	1921	1922	1923	1924
Bauxite [2]	tons	31,883	[2] 20,010		[3] 101,957	[3] 156,800
Diamonds	number	234,456	507,200	816,857	1,141,425	1,055,425
	carats	39,363	102,604	163,641	214,474	185,586
Gold, crude	grams	394,765	399,027	338,313	225,873	223,541
Stone	tons	6,134	5,404	(4)	(4)	20,646

[1] Report on the Lands and Mines Department, British Guiana.
[2] Early in 1921 work at the bauxite mines stopped and the mines remained closed until late in 1922, when work was resumed. Shipments from stocks were made in 1921. There were no shipments in 1922.
[3] Exports.
[4] Data not available.

BRITISH HONDURAS

British Honduras has no mining industry of commercial importance. Ower[12] reports the existence of diatomaceous earth, gold, molybdenite, monazite, petroleum, and tin. Gold quartz assaying 1 pennyweight per ton has been found. Traces of tin have been reported from numerous localities, but payable deposits have not been located; samples indicate that the Vaca Pine Ridge district is the most promising area. Indications of petroleum have been noted.

[10] Information supplied by A. M. Warren, U. S. consul, Nairobi, 1925.
[11] Uganda, Geol. Survey; Ann. Rept. 1920 and 1925, Entebbe; Wayland, E. J., Petroleum in Uganda: Mem. 1, Entebbe, 1925.
[12] Ower, Leslie H., "Mineral resources of British Honduras": Min. Mag., London, vol. 32, 1925, pp. 49–50; also Min. Jour., London, vol. 148, 1925, p. 58. (Economic geology of British Honduras.)

BRITISH WEST AFRICA

Cameroons.—Deposits of copper, gold, iron ore, arsenical pyrite, lead, manganese, mica, and salt are reported,[13] but they have not been exploited, and their commercial importance is unknown. Natives smelt a little iron for local needs, but otherwise the mineral industry is undeveloped.

Gambia.—The chief products of the colony are agricultural, and no information as to mineral resources is available.

Gold Coast and Ashanti.—See Gold Coast (p. 476).

Nigeria.—See Nigeria (p. 492).

Sierra Leone.—Extensive and rich deposits of iron ore are known, but their value is lessened by the high content of titanium. Other proved deposits of minerals comprise thin seams of asbestos, bauxite of a somewhat low grade, gold, graphite, manganese, calcareous marl, mica, soapstone, and building stone. Except for a little iron smelting by the natives the mineral resources of the colony have not been developed.[14]

Togo.—Deposits of bauxite, chromite, gold, iron, and lead are reported, but no information is available as to their development or their commercial importance.[15]

BRITISH WEST INDIES

Bahamas.—There are no mines. Limestone is quarried for local use, and small quantities are exported. Salt is produced by the evaporation of sea water; figures of output are not available, but the quantities exported are given in the accompanying table.

Barbados.—Chalk, diatomaceous earth, limestone and sandstone, manjak, and petroleum are produced. The output of chalk and diatomaceous earth is very small. About 12 sandstone quarries are worked regularly, besides a number of smaller ones that are worked intermittently. Limestone is quarried in many parts of the island, and small quantities are exported for building purposes to the neighboring islands and Demerara. No figures on the production of stone are available. Manjak has been mined in the island since 1895,[16] and the exports are reported as follows: 1920, 92 tons; 1921, 111 tons; 1922, 133 tons; 1923, 152 tons; 1924, 71 tons. Salt is produced from sea water by evaporation. The production of petroleum is estimated to be about 15,000 hectoliters a year.

Jamaica.—Except for the quarrying of limestone and other material for road building, no mineral industry exists in the island of Jamaica. On Cayman Islands are phosphate deposits, but they have not been worked for some time. The salt industry of Turks and Caicos Islands is the most important of the British West Indies. There are 231 acres of salt ponds at Grand Turk, 114 at Salt Cay, and 248 at Cockburn Harbor. The yearly outturn per acre is roughly estimated at about 4,000 bushels but depends upon fine weather, and the actual production ranges from 1,500,000 bushels

[13] Koert, W., "Ergebnisse der neueren geologischen Forschung in den deutsch-afrikanischen Schutzgebieten": Beiträge geol. Erforsch. deutsch. Schutzgeb., No. 1, 1913, pp. 31–82.
[14] Report of the Geological Survey of Sierra Leone, Freetown, Sierra Leone, 1921.
[15] Koert, W., Work cited.
[16] Information supplied by John J. C. Watson, U. S. consul, Bridgetown, Barbados, 1922.

in poor seasons to about 2,225,000 in good years.[17] Details of the exports of salt appear in the table below.

Leeward Islands.—There is a deposit of phosphate rock on the island of Redonda, but so far as known there has been no production in recent years. Salt is produced from sea water and is exported.

Trinidad and Tobago.—See Trinidad (p. 507).

Windward Islands.—The only mineral industry reported is the making of salt from sea water on the island of Grenada. Exports of salt are given in the following table:

Salt exported from the British West Indies, 1920–1924, in tons [1]

Islands	1920	1921	1922	1923	1924
Bahamas	1,829	3,201	3,079	2,723	1,595
Jamaica (Turks and Caicos Islands)	48,394	(2)	66,704	58,992	53,167
Leeward Islands	(3)	(4)	(4)	(4)	1,207
Windward Islands (Grenada)	(3)	42	20	67	54

[1] Publications, Imp. Min. Res. Bur., London.
[2] Quantity not available, value reported, £28,171.
[3] Data not available.
[4] Quantity not available, value reported as follows: 1921, £35; 1922, £24; 1923, £639.

BULGARIA

Mineral production of Bulgaria, 1920–1924 [a]

Mineral	1920	1921	1922	1923	1924
Bauxite—tons					[b] 796
Coal:					
Bituminous—do	32,333	37,926	46,725	61,600	69,670
Lignite—do	724,916	901,660	983,311	1,012,594	1,155,291
Copper:					
Ore—do	4,475	13,968	24,473	23,983	25,916
Matte—do				[c] 1,348	1,511
Gold, fine—grams				852	1,500
Iron ore—tons				[d] 300	300
Lead ore—do	478	2,536	3,022	4,935	175,380
Stone [e]—do	(e)	(e)	[d] 1,085	(e)	(e)
Zinc ore—do			75	(f)	(f)

[a] Data furnished by the Ministry of Commerce, Industry, and Labor.
[b] Content of Al_2O_3, 79 per cent.
[c] Lead and copper matte.
[d] Exports.
[e] Limestone and marble are produced, but figures for output are not available.
[f] Data not available.

[17] Handbook of Jamaica, 1920.

CANADA

Mineral production of Canada, 1920–1924 [1]

Mineral	1920	1921	1922	1923	1924
Abrasives:					
Corundum tons	178	366			
Garnet do				1,134	327
Grindstones, etc do	2,217	1,162	912	1,827	2,441
Pumice (volcanic ash) do					222
Tripolite do	236	309	199	118	30
Actinolite do	91	71	45	48	82
Arsenic, white [2] do	2,231	1,353	2,337	2,912	2,096
Asbestos [3] do	162,038	61,083	109,128	164,014	150,768
Barite do	681	245	262	371	137
Bituminous sand do					482
Cement do	1,056,045	913,308	1,102,401	1,197,594	1,190,455
Chromite, crude do	9,993	2,538	696	3,228	
Clay:					
Fire clay do	7,549	2,659	9,250	2,436	3,307
Kaolin do	620	112	1,086	148	
Clay products [4]	($9,521,222)	($7,932,610)	($11,264,397)	($10,277,046)	($9,098,238)
Coal:					
Anthracite tons	115,677	87,964	36,665	97	
Bituminous do	11,904,854	10,596,295	10,550,946	12,163,804	9,138,841
Lignite do	3,353,234	2,975,598	3,162,907	3,249,605	3,233,459
Cobalt [5] kilograms	247,671	114,298	279,451	344,776	430,323
Coke:					
Gas house [6] tons	391,314	404,409	478,536	447,191	409,689
Metallurgical [6] do	1,106,081	861,787	605,814	1,037,985	833,691
Coke by-products: [7]					
Ammonium sulphate do	19,806	17,666	12,339	19,521	15,733
Coke breeze do	46,330	28,057	33,882	28,274	60,158
Light oils (toluol, benzol, etc.) liters	([8])	([8])	([8])	([8])	8,225,284
Tar and tar products do	65,159,263	83,271,734	67,718,160	80,601,687	86,362,577
Copper:					
Metallic [9] kilograms	37,013,257	21,600,328	19,449,857	39,408,596	47,380,853
Refined copper tons	2,350	1,944	331	748	1,620
Copper sulphate kilograms	81,222	292,071	104,704	139,313	57,742
Feldspar tons	34,358	27,096	25,153	26,512	40,645
Fluorspar do	10,122	5,007	4,085	126	69
Gold, fine grams	23,794,381	28,812,056	39,295,018	38,361,198	47,444,690
Graphite tons	1,987	850	542	1,010	1,210
Gypsum, crude mined do	417,321	394,211	439,646	506,980	638,413
Iron:					
Ore [10] do	117,092	53,985	16,303	27,904	1,343
Pig iron [11] do	1,014,743	625,666	410,192	923,361	629,386
Iron oxides [12] do	17,353	8,208	6,609	9,456	6,592
Lead:					
Ore and concentrates do	63,043	13,843	24,554	65,986	139,158
Metallic [13] kilograms	16,308,246	30,245,196	42,323,200	50,454,841	79,598,467
Refined lead tons	13,027,118	27,646,217	36,927,994	45,856,276	59,180,435
Lime:					
Hydrated do	32,291	29,011	40,481	46,960	41,808
Quicklime do	267,039	189,408	244,422	271,674	248,302
Magnesite:					
Crude mined do	28,159	8,447	7,873	12,079	9,512
Calcined do	2,861	621	931	109	1,393
Dead-burned do	9,914	1,245	1,654	4,247	2,121
Magnesium sulphate:					
Crude do	1,766	1,281	402		
Refined do		560	524	110	
Manganese ore do	589	62	66	181	530
Mica do	1,999	637	3,038	3,198	3,711
Molybdenum concentrates [14] do					9,277

[1] Dominion Bur. of Statistics; Ann. Rept. of the mineral production of Canada; Iron and steel and their products; Coal and coke statistics for Canada; Manufactures of the nonmetallic minerals of Canada. The data relate to sales and shipments, except as otherwise noted.

[2] Figures include estimated arsenic content of ores exported, as follows: 1920, 570 tons; 1922, 470 tons; 1923, 572 tons; 1924, 465 tons.

[3] Exclusive of by-products (sand, finish, and floats) the production of which is reported as follows: 1920, 19,011 tons; 1921, 2,306 tons; 1922, 39,382 tons; 1923, 45,982 tons; 1924, 54,023 tons.

[4] Values given include value of kaolin and fire clay. Conversion from Canadian to United States currency has been made on the basis of the annual average rates of exchange as compiled in the U. S. Federal Reserve Board.

[5] Figures represent cobalt content of all smelter products sold or shipped.

[6] Exclusive of coke breeze.

[7] Made for sale or use.

[8] Data not available.

[9] Copper content of blister copper and ores and concentrates exported, of nickel-copper mattes exported or refined in Canada, and of copper sulphate.

[10] Exclusive of iron oxides used for paint and for purification of gas.

[11] Includes ferro-alloys.

[12] Used for paint and for purification of gas.

[13] Figures represent pig lead produced, and the estimated lead content of ores and concentrates exported.

[14] MoS_2 content reported as 91.62 per cent.

Mineral production of Canada, 1920–1924—Continued

Mineral	1920	1921	1922	1923	1924
Natro-alunite—tons		27	45	14	
Natural gas—cubic meters	477,014,803	398,635,653	415,768,863	451,956,084	421,395,030
Nickel:					
Ore mined [15]—tons	1,030,368	233,285	235,476	1,077,145	1,280,918
Metallic [16]—kilograms	27,821,263	8,751,139	7,981,879	28,328,439	31,540,993
Peat—tons	4,128	1,511	2,700		
Petroleum, crude—hectoliters	312,090	298,230	284,765	270,613	255,670
Phosphate rock (apatite)—tons		27	172	27	
Platinum metals:					
Palladium—grams	5,412	18,351	22,519	51,871	277,536
Platinum—					
From placers, fine—do	529	715	373	218	156
From mattes, etc., fine [17]—do	2,768	8,367	14,245	37,635	285,561
Rhodium, osmium, and iridium, fine—grams	622	1,742	12,161	9,455	18,444
Pyrite—tons	158,524	30,271	16,459	25,937	21,366
Quartz (silica)—do	116,387	91,036	99,742	239,564	136,890
Salt—do	190,376	149,374	164,920	[18] 187,773	[18] 191,176
Sand:					
Glass sand—do		122		869	
Other sand, and gravel—do	10,460,507	10,500,361	10,583,501	11,567,957	10,526,463
Silver, fine—kilograms	414,620	421,241	579,347	578,579	613,868
Slate:					
Roofing slate [19]—squares	1,532	415			
Crushed slate—tons	218	2,025	1,723	1,666	
Sodium carbonate—do		179	183	240	463
Sodium sulphate, natural:					
Crude—do	736	101	149	191	875
Refined—do		464	308	474	107
Steel, crude (ingots and castings)—do	1,118,278	678,191	489,854	898,963	670,351
Stone:					
Granite—do	[8]	289,752	415,420	361,450	380,989
Limestone—do	[8]	3,013,674	2,859,544	3,345,374	3,854,663
Marble—do	[8]	1,497	1,735	2,243	3,973
Sandstone—do	[8]	25,787	22,880	20,653	85,822
Strontium ore—do	68				
Talc and soapstone—do	19,659	9,184	11,970	9,404	10,280
Zinc:					
Metallic [20]—kilograms	17,567,432	24,080,801	25,533,000	27,404,202	44,864,168
Refined zinc [21]—tons	16,798	24,035	25,533	27,238	24,897

[8] Data not available.
[15] Mined in the Sudbury district.
[16] Figures represent nickel content of mattes made and of cobalt ores.
[17] Produced by Canadian and United States refineries from Canadian mattes and residues.
[18] Production.
[19] One square of roofing slate is amount needed to cover 100 square feet (=9.29 square meters) of roof.
[20] Smelter recoveries and estimated as recoverable from ores and concentrates exported.
[21] Made at Trail, British Columbia.

Mineral production of Canada, 1920–1924, by Provinces [1]

Province and mineral	1920	1921	1922	1923	1924
ALBERTA					
Bituminous sand—tons	[2]	[2]	[2]	[2]	482
Cement—do	[2]	[2]	56,868	50,605	66,127
Clay, fire clay—do			7,326		
Clay products [3]	($702,093)	($636,267)	($689,410)	($578,962)	($533,625)
Coal:					
Anthracite—tons	115,677	87,964	36,665	97	
Bituminous—do	3,101,782	2,601,641	2,582,201	3,365,905	1,909,206
Lignite—do	3,049,127	2,671,119	2,815,968	2,852,169	2,798,813
Gold, fine—grams		1,524			
Lime:					
Hydrated—tons			25	30	13
Quicklime—do	4,427	3,400	4,122	2,756	2,852
Natural gas—cubic meters	159,522,267	140,052,676	166,176,681	203,646,634	201,931,076
Petroleum—hectoliters	17,544	11,455	10,431	3,090	1,342
Sand and gravel—tons	[2]	[2]	1,034,150	805,772	558,455
Stone:					
Limestone—do					14,894
Sandstone—do	[2]	2,687	503		254

[1] In a few instances the sum of the figures by Provinces for a mineral do not agree with the total for Canada because the figure for the Dominion includes the output for Prince Edward Island, not shown separately or because revisions in the total for the Dominion are not given in the data published by Provinces.
[2] Data not available.
[3] Value of fire clay included.

Mineral production of Canada, 1920–1924, by Provinces—Continued

Province and mineral	1920	1921	1922	1923	1924
BRITISH COLUMBIA					
Abrasives: Grindstones ..... tons					218
Arsenic, white ..... do	570		470	552	225
Cement ..... do	(2)	(2)	62,088	126,313	74,985
Clay, fire clay ..... do	(2)	895	894	974	1,191
Clay products [3]	($532,239)	($372,431)	($440,643)	($417,765)	($454,755)
Coal, bituminous ..... tons	2,807,732	2,622,014	2,655,346	2,561,247	1,990,051
Copper, metallic ..... kilograms	20,556,595	15,624,872	14,485,933	25,049,388	29,688,031
Fluorspar ..... tons	6,783	4,902	3,827	68	
Gold, fine ..... grams	3,881,963	4,690,156	6,449,929	6,225,051	7,642,716
Gypsum, crude mined ..... tons		36	91	444	27
Iron ore ..... do	1,089	916	1,139	220	26
Iron oxide ..... do		153	3	465	109
Lead, metallic ..... kilograms	14,874,452	27,350,843	39,504,635	45,151,173	76,415,231
Lime:					
Hydrated ..... tons	17,822	1,471	2,639	4,000	3,771
Quicklime ..... do		4,858	13,771	17,939	16,434
Magnesite, crude ..... do		729			
Magnesium sulphate:					
Crude ..... do	1,764	1,279	402		
Refined ..... do		560	524	110	
Manganese ore ..... do	533				
Natro-alunite ..... do		27	45	14	
Platinum, from placers, fine ..... grams	529	715	373	218	156
Pyrite ..... tons	10,228	3,263	6,267	3,136	7,340
Quartz (silica) ..... do	32,546	20,219	15,808	23,215	19,376
Sand and gravel ..... do	(2)	(2)	871,120	721,786	1,002,850
Silver, fine ..... kilograms	103,482	104,207	222,419	190,146	253,587
Sodium carbonate ..... tons		179	183	240	463
Stone:					
Granite ..... do	(2)	98,180	145,062	137,337	136,551
Limestone ..... do		30,677	33,172	12,438	24,542
Sandstone ..... do			1,088		590
Talc and soapstone ..... do	100	142	173	222	150
Zinc, metallic ..... kilograms	17,567,432	24,080,801	25,533,000	27,238,079	43,544,671
MANITOBA					
Cement ..... tons	(2)	(2)	68,162	50,837	45,555
Clay products	($184,591)	($187,154)	($207,533)	($156,988)	($115,960)
Copper, metallic ..... kilograms	1,389,154				
Gold, fine ..... grams	24,292	6,438	4,852	964	36,702
Gypsum, crude mined ..... tons	(2)	44,244	35,513	35,594	28,625
Lime (quicklime) ..... do	19,222	13,122	16,675	16,642	12,517
Natural gas ..... cubic meters	5,600	5,600	5,600	5,600	5,600
Sand and gravel ..... tons	(2)	(2)	707,810	540,270	326,163
Silver, fine ..... kilograms	482	1	(4)	(4)	4
Stone: Limestone ..... tons	(2)	15,302	31,167	46,542	49,047
NEW BRUNSWICK					
Abrasives: Grindstones, etc ..... tons	2,026	996	819	1,595	1,917
Clay, fire clay ..... do		54			45
Clay products [3]	($65,604)	($59,644)	($74,277)	($61,357)	($74,032)
Coal, bituminous ..... tons	155,681	169,817	260,826	250,941	196,968
Gypsum, crude mined ..... do	(2)	56,265	51,430	73,980	86,764
Lime, quicklime ..... do	22,285	17,858	17,807	10,464	6,610
Manganese ore ..... do					530
Natural gas ..... cubic meters	19,326,420	20,069,487	21,348,141	18,131,385	16,989,417
Petroleum, crude ..... hectoliters	8,186	11,894	12,369	14,036	8,843
Sand and gravel ..... tons	(2)	216,990	406,709	552,044	128,726
Stone:					
Granite ..... do	(2)	12,995	10,332	10,441	4,464
Limestone ..... do				9,697	12,980
Sandstone ..... do		726	579	227	
NOVA SCOTIA					
Abrasives:					
Grindstones, etc ..... tons	191	166	93	232	306
Tripolite ..... do	236	309	199	118	30
Arsenic, white ..... do				20	172
Barite ..... do	681	245	262	190	137
Clay, fire clay ..... do	(2)	1,073	297	1,079	1,785
Clay products [3]	($483,085)	($323,975)	($421,136)	($405,840)	[5] ($354,733)
Coal, bituminous ..... tons	5,839,659	5,202,612	5,052,151	5,985,427	5,041,599
Feldspar ..... do		15			
Gold, fine ..... grams	21,462	[6] 13,001	32,410	20,373	32,565

[3] Data not available.
[3] Value of fire clay included.
[4] Less than 1 kilogram.
[5] Value of a small output from Prince Edward Island included.
[6] Royal mint reports 13,654 grams received from Nova Scotia in 1921, of which 653 were from old dumps.

Mineral production of Canada, 1920–1924, by Provinces—Continued

Province and mineral	1920	1921	1922	1923	1924
NOVA SCOTIA—continued					
Gypsum, crude mined tons	(2)	219, 226	255, 699	295, 354	433, 799
Iron, pig [7] do	301, 631	153, 771	122, 706	282, 108	179, 918
Lime:					
Hydrated do					71
Quicklime do	6, 398	823		1, 345	
Manganese ore do	56	62	66	181	
Salt do	2, 742	2, 393	4, 584	4, 064	4, 129
Sand and gravel do	(2)	(2)	201, 794	184, 535	278, 389
Silver, fine kilograms		1	3	1	1
Stone:					
Granite tons		10, 725	11, 543	15, 691	6, 853
Limestone do	(2)	40, 161	61, 799	107, 249	51, 772
Sandstone do		2, 569	6, 448	2, 870	2, 642
ONTARIO					
Abrasives:					
Corundum tons	178	366			
Garnet do				1, 134	327
Actinolite do	91	71	45	48	82
Arsenic, white do	1, 661	1, 353	1, 867	2, 340	1, 699
Asbestos do				6	156
Barite do				181	
Cement do	323, 164	432, 305	492, 842	523, 329	565, 887
Clay, fire clay do	(2)	420	249	89	
Clay products [3]	($5, 011, 498)	($4, 641, 741)	($6, 838, 548)	($6, 147, 410)	($5, 024, 778)
Cobalt kilograms	247, 671	114, 298	279, 451	344, 776	430, 323
Copper, metallic do	14, 542, 092	5, 815, 652	4, 963, 924	14, 359, 208	16, 834, 173
Feldspar tons	33, 769	18, 248	13, 839	15, 603	25, 997
Fluorspar do	3, 409	105	258	58	69
Gold, fine grams	17, 573, 311	22, 027, 890	31, 114, 056	30, 223, 376	38, 622, 064
Graphite tons	1, 775	816	520	969	1, 168
Gypsum, crude mined do	(2)	74, 440	96, 913	101, 608	89, 198
Iron:					
Ore do	115, 132	53, 069	14, 687	27, 621	40
Pig iron [7] do	679, 540	448, 964	266, 404	611, 828	422, 644
Lead, metallic kilograms	1, 023, 081	1, 502, 514	1, 311, 055	1, 996, 474	2, 293, 064
Lime:					
Hydrated tons	162, 238	24, 369	33, 029	37, 854	32, 648
Quicklime do		87, 731	125, 099	152, 737	139, 422
Mica do	1, 330	198	1, 804	1, 796	2, 190
Natural gas cubic meters	298, 160, 452	238, 507, 826	228, 238, 377	230, 172, 401	202, 468, 873
Nickel:					
Ore mined tons	1, 030, 368	233, 285	235, 476	1, 077, 145	1, 280, 918
Metal kilograms	27, 821, 263	8, 751, 139	7, 981, 879	28, 328, 439	31, 540, 993
Peat tons	4, 128	1, 511	2, 700		
Petroleum hectoliters	286, 360	274, 890	261, 965	253, 487	245, 485
Phosphate rock (apatite) tons			53		
Platinum metals:					
Palladium, fine grams	5, 412	18, 351	22, 519	51, 871	277, 536
Platinum, from matte, fine do	2, 768	8, 367	14, 245	37, 635	285, 561
Rhodium, osmium, iridium, etc., fine grams	622	1, 742	12, 161	9, 455	18, 444
Pyrite tons	134, 854	25, 206	10, 192	22, 801	10, 368
Quartz (silica) do	82, 039	65, 379	73, 960	204, 215	101, 282
Salt do	187, 634	146, 951	160, 336	179, 547	184, 546
Sand:					
Glass sand do		122		869	
Other sand, and gravel do	(2)	5, 690, 775	5, 701, 737	7, 389, 412	5, 601, 187
Silver, fine kilograms	308, 162	303, 620	336, 288	327, 860	350, 616
Stone:					
Granite tons		150, 064	168, 498	171, 455	194, 763
Limestone do	(2)	2, 311, 154	1, 931, 177	2, 210, 301	2, 372, 194
Sandstone do		2, 755	2, 502	4, 965	9, 590
Strontium ore do	68				
Talc and soapstone do	19, 423	9, 042	11, 661	8, 647	9, 723
Zinc, metallic kilograms	6, 328				
QUEBEC					
Asbestos tons	162, 038	61, 083	109, 128	164, 008	150, 612
Cement do	478, 407	339, 045	422, 441	503, 892	437, 901
Chromite, crude do	9, 993	2, 538	696	3, 228	
Clay:					
Fire clay do	(2)	36	106		
Kaolin do	620	112	1, 086	148	

[2] Data not available. [3] Value of fire clay included. [7] Exclusive of ferro-alloys.

Mineral production of Canada, 1920–1924, by Provinces—Continued

Province and mineral	1921	1922	1923	1924	1925
QUEBEC—continued					
Clay products [8]	($2,107,813)	($1,562,518)	($2,456,281)	($2,389,342)	($2,404,815)
Copper, metallic kilograms	399,449	159,804			858,649
Feldspar tons	589	8,833	11,314	10,909	14,648
Gold, fine grams	29,704	19,751		20,746	27,464
Graphite tons	212	34	22	41	42
Iron:					
Ore do	871		477	63	1,277
Pig iron [7] do	[9] 8,015	620			
Iron oxide do	17,353	8,055	6,606	8,991	6,483
Lead, metallic kilograms	410,713	270,286		235,885	480,344
Lime:					
Hydrated tons	66,938	3,171	4,788	5,076	5,305
Quicklime do		61,616	66,948	69,791	70,467
Magnesite:					
Crude mined do	28,159	7,718	7,873	12,079	9,512
Calcined do	2,861	621	931	109	1,393
Dead-burned do	9,914	1,245	1,654	4,247	2,121
Mica do	669	439	1,234	1,402	1,521
Molybdenum concentrates kilograms					[10] 9,277
Phosphate rock (apatite) tons		27	119	27	
Pyrite do	13,442	1,802			3,658
Quartz (silica) do	1,802	5,438	9,974	12,134	16,232
Sand and gravel do	(2)	635,633	821,090	957,816	1,993,206
Silver, fine kilograms	1,897	1,185		1,027	2,607
Slate:					
Roofing squares	1,532	415			
Crushed tons	218	2,025	1,723	1,666	
Stone:					
Granite do	(3)	17,788	79,985	26,526	38,358
Limestone do		616,380	802,229	959,147	1,329,234
Marble do		1,497	1,735	2,243	3,973
Sandstone do		17,050	11,760	12,591	72,746
Talc and soapstone do	136		136	535	407
SASKATCHEWAN					
Abrasives: Pumice (volcanic ash) tons					222
Clay, fire clay do	(2)	181	378	294	286
Clay products [8]	($420,890)	($148,880)	($132,654)	($117,059)	($135,540)
Coal, lignite tons	304,107	304,479	346,939	397,436	434,646
Magnesium sulphate, crude do	2	2			
Salt do		30			
Sand and gravel do	(2)	(2)	839,091	397,634	637,487
Sodium sulphate:					
Crude do	736	101	149	191	875
Refined do		464	308	474	107
YUKON					
Coal, bituminous tons	[11] 692	211	422	284	1,017
Copper, metallic kilograms	125,967				
Gold, fine grams	2,263,649	2,052,643	1,693,771	1,870,688	1,083,179
Lead, metallic kilograms		1,121,553	1,507,510	3,071,309	409,828
Silver, fine do	597	12,227	20,637	59,545	7,053

[2] Data not available.
[3] Value of fire clay included.
[7] Exclusive of ferro-alloys.
[8] Value of fire clay included, but that for kaolin excluded. Values for kaolin reported as follows: 1920, $13,411; 1921, $1,691; 1922, $17,614; 1923, $2,322. (See also footnote 4 under table for the Dominion.)
[9] Made in electric furnaces from scrap iron.
[10] Content of MoS_2 reported as 91.62 per cent.
[11] Not included in total reported for Canada.

CEYLON

Mineral production of Ceylon, 1920–1924[1]

[Exports]

Mineral	1920	1921	1922	1923	1924
Gems[2]	(2)	(2)	(2)	(2)	(2)
Graphite tons	9,353	4,419	11,024	10,840	9,806
Mica kilograms	14,021	4,674	1,016	864	
Monazite sand tons	65		30		
Salt do	16,775	13,952	39,623	28,834	9,414

[1] Data furnished by the Inspector of Mines and the Salt Adviser, Ceylon, through the United States consul.

[2] Sapphires, rubies, and gem corundum are mined in Ceylon. Accurate data of the production and exports of gems are not available, but the value of the annual output may be roughly estimated at about 5,000,000 rupees. (M. M. Vance, United States consul, Colombo, 1921.) The legal value of the rupee is 1s. 4d., or 15 rupees to the pound sterling.

CHILE

Mineral production of Chile, 1920–1924[1]

Mineral	1920	1921	1922	1923	1924
Borax tons	15,823	17,541	33,289	34,673	32,427
Clay:					
Kaolin do	650	660	360	600	500
Other clay do	5,738	3,066	1,898	3,886	3,031
Coal do	1,063,185	1,275,117	1,053,001	1,164,028	1,539,141
Cobalt ore kilograms					[2] 34,588
Copper:					
Ore[3] tons	6,976,920	2,510,847	6,748,710	10,099,175	10,586,922
Metal, fine kilograms	98,951,942	59,239,341	129,575,144	182,384,491	189,571,270
Gold, fine grams	1,654,418	1,404,259	2,483,407	3,283,002	3,483,971
Gypsum tons	5,270	11,806	7,096	8,280	5,691
Iodine kilograms	350,066	534,094	244,779	471,077	591,396
Iron ore[4] tons	3,100	8,000	289,595	673,350	1,049,860
Lead ore[5] do	66	134	1,064	2,824	2,762
Lime do	21,228	23,637	88,900	65,060	42,667
Manganese ore[6] do	11,633	23	900	4,287	4,243
Nitrates do	2,523,458	1,309,685	1,071,041	1,903,524	2,406,041
Phosphate rock (apatite) do	1,510	1,200	500		
Potash, perchlorate of (exports) kilograms	33,487	43,245			
Salt tons	33,951	39,466	33,743	38,242	36,093
Silver, fine kilograms	81,008	79,594	84,266	103,809	94,346
Stone: Marble tons	200				
Sulphur do	13,340	9,670	12,250	11,380	9,765

[1] Anuario estadístico de la República de Chile; Sinopsis estadística de la República de Chile.

[2] Average cobalt content reported as 6 per cent.

[3] Average copper content is reported as follows: 1920, 2.30 per cent; 1921, 2.38 per cent; 1922, 2.16 per cent; 1923, 2.04 per cent; 1924, 2.02 per cent.

[4] The Bethlehem-Chile Iron Mines Co. reports the output from its Tofo mine in the Province of Coquimbo as follows: 1921, 48,393 tons; 1922, 222,947 tons; 1923, 679,187 tons; 1924, 987,969 tons.

[5] Average lead content reported as follows: 1920, 50 per cent; 1921, 34 per cent; 1922, 30.25 per cent; 1923, 55.40 per cent; 1924, 47.60 per cent.

[6] Average manganese content reported as follows: 1920, 55 per cent; 1921, 63 per cent; 1922, 50 per cent; 1923, 48.25 per cent; 1924, 50 per cent.

CHINA

Mineral production of China, 1920–1924[1]

[Exports]

Mineral	1920	1921	1922	1923	1924
Alum, white ..... tons	4,513	3,739	4,043	4,423	4,795
Antimony:					
Ore ..... do	1,352	1,177	1,844	2,050	570
Crude ..... do	4,557	2,534	1,604	2,928	1,892
Regulus ..... do	9,726	12,666	12,158	11,679	10,696
Refuse ..... kilograms			181		
Arsenic:					
Realgar ..... tons	472	258	549	413	472
White arsenic ..... do	49	100	30	176	237
Asbestos ..... do	5	[2] 169	[2] 197	[2] 128	[2] 127
Bismuth ore ..... do	90	56	[3]	[3]	[3]
Cement ..... do	10,511	5,241	411	16,177	24,660
Coal [4] ..... do	19,484,896	19,876,375	22,681,000	19,954,529	20,969,000
Coke ..... do	19,410	35,721	45,097	29,795	27,606
Copper:					
Ore ..... do	206	[3]	[3]	[3]	[3]
Ingots and slabs ..... kilograms	191,234	957,498	313,038	848,758	841,742
Gold, fine [5] ..... do	3,888	3,110	3,110	2,784	3,337
Gypsum ..... tons	5,286	6,156	7,754	7,274	5,123
Iron:					
Ore [4] ..... do	1,489,731	1,270,000	1,370,751	1,400,820	1,100,000
Pig iron ..... do	185,389	160,154	203,361	203,106	265,468
Lead:					
Ore ..... do	2,391	6,175	5,099	4,919	7,232
Metal [6] ..... do	330	285	678	747	1,134
Oxides ..... do	104	131	134	76	54
Manganese ore ..... do	25,324	25,627	19,230	27,672	38,538
Mercury, metallic ..... do	45	98	17	2	3
Molybdenum ore ..... do	16	1,916	[3]	[3]	[3]
Potash ..... do	542	608	493	479	587
Salt ..... do	341,633	293,130	288,462	224,162	202,031
Silver, fine [5] ..... kilograms	1,555	1,244	3,110	3,110	3,421
Soapstone [7]	[7]	[7]	[7]	[7]	[7]
Soda ..... tons	211	171	173	863	611
Tin:					
Slabs ..... do	11,487	6,231	9,173	8,057	7,097
Compound ..... do	14	12	5	7	7
Tungsten ore: Wolfram ..... do	4,190	2,362	3,443	4,048	3,044
Zinc:					
Ore ..... do	9,116	11,928	61,242	61,064	20,456
Metal [6] ..... do	98	1,085	121	241	212

[1] Foreign Trade of China, Maritime Customs, part 2, except as otherwise noted.
[2] Figures published by the Imp. Min. Res. Bur., London.
[3] Data not available.
[4] Production. Data furnished by the Director of the Geological Survey of China.
[5] Production. Figures as published by the Director, U. S. Mint
[6] Smelter product.

[7] Exports of unmanufactured soapstone not available. The exports of soapstone ware are reported as follows: 1920, 41 tons; 1921, 331 tons; 1922, 239 tons; 1923, 191 tons; 1924, 221 tons.

COLOMBIA

No recent official statistics covering the mineral production of Colombia are available. Deposits of asphalt, coal, copper, emeralds, gold, iron, lead, manganese, petroleum, platinum, quicksilver, rock salt, silver, and zinc exist and some are being exploited.

Colombia takes high rank as a producer of platinum and emeralds, now surpassing Russia in output of platinum and holding almost a monopoly in the emerald trade. The coal deposits of the country are large, but have not been mined extensively. The petroleum industry is steadily growing.

The output of gold, petroleum, platinum, and silver, the only minerals for which the data are available, is reported as follows:

Gold, petroleum, platinum, and silver produced in Colombia, 1920–1924

Mineral	1920	1921	1922	1923	1924
Gold, fine [1] ..... kilograms	8,727	9,028	8,577	8,577	3,009
Petroleum [2] ..... hectoliters	.....	106,122	513,175	675,483	707,072
Platinum [3] ..... grams	1,089,000	1,104,000	1,244,000	1,306,000	1,431,000
Silver, fine [1] ..... kilograms	14,930	15,552	98	98	90

[1] Figures of production as published by the Director, U. S. Mint.
[2] Production data reported by United States consular officers and by reliable trade journals.
[3] Production as estimated by J. M. Hill, U. S. Bureau of Mines.

COSTA RICA

No recent statistics covering the mineral production of Costa Rica are available. Deposits of asphalt, coal, gold, manganese, petroleum, and silver exist. The precious metals have been mined and exported for many years. During the World War the demand for manganese led to the development of the deposits. In 1920 the exports were 3,253 tons and in 1921, 589 tons, but in 1920 the mines were closed down. Prospecting for petroleum has not resulted in production on a commercial scale.

CUBA

Mineral production of Cuba, 1920–1924 [1]

Mineral	1920	1921	1922	1923	1924
Asphalt ..... tons	3,044	343	109	2,098	3,643
Chromite, crude ..... do	1,000	[2]	.....	[2]	[3] 19,881
Copper ore ..... do	84,439	113,904	191,147	251,166	210,559
Iron ore [4] ..... do	306,570	381,130	468,240	482,276	481,128
Manganese ore ..... do	2,482	2,930	4,351	19,636	25,310
Petroleum ..... hectoliters	16,340	8,529	6,460	5,258	6,164

[1] Boletin de Minas, Dirección de Montes y Minas, Cuba, except as otherwise noted.
[2] No production reported. Imports into the United States from Cuba were as follows: 1921, 610 tons; 1923, 10,587 tons.
[3] Production of the Caledonia mine, reported by the Bethlehem-Cuba Iron Mines Co.
[4] Shipments reported by the Bethlehem Steel Co. were as follows: 1920, 896,952 tons; 1921, 132,451 tons; 1922, 451,933 tons; 1923, 685,195 tons; 1924, 299,283 tons.

CYPRUS

Mineral production of Cyprus, 1920–1924, in tons [1]

Mineral	1920	1921	1922	1923	1924
Asbestos	910	911	2,322	2,186	4,442
Chromite	.....	.....	.....	.....	2,856
Copperas	11	.....	.....	.....	.....
Gypsum	7,228	9,024	12,064	11,206	14,525
Magnesite	.....	[2] 305	895	284	224
Mineral paint ores: Umber	[3]	8,336	4,145	5,186	4,909
Pyrite, cupreous iron [4]	1,400	11,737	29,667	62,509	141,050
Salt	625	899	3,022	778	813
Sulphur	12	.....	.....	.....	.....
Terre-verte	.....	.....	.....	29	.....

[1] Cyprus Blue Book. Data relate to exports unless otherwise noted.
[2] Quantity mined, no exports reported.
[3] Data not available.
[4] Production. Average content reported as copper, 2 per cent; sulphur, 50 per cent.

CZECHOSLOVAKIA

Mineral production of Czechoslovakia, 1920–1924[1]

Mineral	1920	1921	1922	1923	1924
Antimony:					
Ore—tons	1,376	1,599	416	1,887	4,442
Regulus—do	156	530		272	347
Bismuth ore—do	75	20		307	134
Briquets, fuel—do	283,716	333,831	237,451	295,837	251,324
Coal:					
Bituminous—do	11,374,954	12,023,209	10,464,990	12,347,251	15,178,942
Lignite—do	20,156,610	21,335,128	19,174,296	16,265,530	20,459,690
Coke[2]—do	1,706,232	1,419,139	882,365	1,809,598	2,220,556
Copper:					
Ore—do	3,753	13	12	172	590
Slimes—do	4	11	7	8	23
Cement copper—do	159	543	671	1,402	2,110
Electrolytic copper—do	179	154	175	152	301
Gold ores—do	17,792	31,120	19,851	13,943	34,007
Gold, fine[3]—grams	273,310	355,141	264,537	103,707	280,271
Graphite—tons	22,925	13,522	10,500	9,873	11,935
Iron:					
Ore—do	1,053,124	800,829	313,149	675,185	1,173,935
Pig iron[4]—do	737,452	576,594	334,837	817,050	983,042
Lead:					
Ore—do	3,014	8,862	6,060	5,116	849
Metal—					
Hard lead—do	366	283		211	193
Soft lead—do	1,640	2,105	2,228	2,240	2,071
Litharge—do	134	105	166	112	152
Manganese ore—do	50,315	43,541	23,557	42,053	79,133
Natural gas—cubic meters	(5)	(5)	(5)	(5)	597,359
Nickel ore—tons		80	52	195	(5)
Petroleum, crude—do	10,110	14,065	18,299	10,849	11,157
Pyrite:					
Arsenical—do	(5)	35,147	8,968	24	217
Iron—do	(5)			(5)	15,935
Quicksilver:					
Ore—do	1,038	2,780	(5)	73	40
Metallic—quintals	567	571	63	515	778
Salt—tons	30,989	91,199	128,179	134,080	124,773
Silver ores—do	48,336	53,939	49,463	18,294	15,581
Silver, fine[3]—kilograms	21,289	20,514	27,375	21,845	22,785
Tin:					
Ore—tons	2,392	2,737	1,839	(5)	(5)
Metal—do		13	15		(5)
Tungsten ore: Wolfram—do	48	35	28	35	66
Uranium:					
Concentrates—do	9	8	10	11	28
Radium salts—milligrams	3,442	5,138	5,676	4,291	3,052
Radium element contained—do	2,281	3,208	2,272	1,526	1,433
Radium colors—kilograms	9,006	10,134	11,049	10,003	10,928
Zinc:					
Ore—tons	2,077	1,781	1,316	25	690
Metal (crude zinc)—do	2,054	3,220	2,045	2,197	6,897

[1] Rapports de l'Office de Statistique, Prague; supplementary data furnished by the same bureau.
[2] Gas-house coke included.
[3] Estimated content of bullion and ores produced.
[4] Includes ferro-alloys.
[5] Data not available.

DENMARK

Mineral production of Denmark, 1920–1924, in tons [1]

Mineral	1920	1921	1922	1923	1924
Cement, Portland	251,369	311,897	470,353	655,432	681,921
Chalk:					
Crude	74,950	55,022	16,331	9,643	26,654
Washed	14,438	10,529	10,196	12,706	13,899
Coal, lignite [2]	(2)				
Flint:					
Pebbles	11,162	13,000	15,726	20,914	25,570
Other	7,746	8,000	8,594	9,507	13,005
Kaolin	[3] 17,808	(4)	21,747	10,000	(4)
Lime	47,654	35,677	106,855	64,646	55,689
Marls for fertilizer:					
Crude	186,358	180,964	(4)	(4)	109,000
Crushed	50,606	54,467	(4)	(4)	
Stone:					
Building stone	1,660	452	(4)	(4)	(4)
Limestone for industrial uses [5]	(4)	3,932	80,125	65,709	143,902

[1] Data furnished by the Statistiske Departement, Copenhagen, through the United States consul general.
[2] A small quantity of lignite was mined in the years 1918–1920.
[3] Exports.
[4] Data not available.
[5] Reported as "crude lime."

DOMINICAN REPUBLIC

The mineral industry of the Dominican Republic is small and no statistics of production are available. Deposits of amber, coal (lignite), copper, gold, gypsum, iron, lead, manganese, nickel, petroleum, and salt are reported,[18] but few of them are of commercial importance. Search for petroleum has not resulted in commercial production.

ECUADOR

No official statistics covering the mineral output of Ecuador are available.

The chief mineral products of the country are gold, petroleum, silver, and salt. Coal and manganese have been mined, but not on a commercially important scale. Deposits of barite, copper, graphite, gypsum, iron, kaolin, lead, mica, and sulphur have also been reported,[19] but they remain virtually undeveloped.

Development of the oil fields is actively progressing, and the annual output is now estimated to be about 79,000 hectoliters.

The production of gold and silver is reported as follows:

Gold and silver produced in Ecuador, 1920–1924 [a]

Metal	1920	1921	1922	1923	1924
Gold, grams	1,128,465	1,127,781	1,320,529	1,320,529	1,203,705
Silver, kilograms	1,089	2,333	2,333	2,333	2,177

[a] Director, U. S. Mint.

[18] Vaughan, T. W., Cooke, C. W., and others, "A geological reconnaissance of the Dominican Republic". Dominican Republic Geol. Surv. Mem., vol. 1, Washington, 1921, pp. 228–254.
[19] Information supplied by F. W. Goding, United States consul general, Guayaquil, 1921.

EGYPT

Mineral production of Egypt, 1920–1924 [1]

Mineral	1920	1921	1922	1923	1924
Gold, fine.....grams..	4,000		7,496	15,454	29,051
Magnesium sulphate.....tons..	266	115			
Manganese ore.....do....	77,562	55,065	104,143	132,384	150,194
Mineral paint ores: Ocher.....do....	231	430	350	35	45
Nitrate of soda.....do....	4,743				
Nitrate shale.....do....				2,567	1,582
Petroleum.....do....	147,950	178,902	170,155	153,409	163,341
Phosphate rock.....do....	114,813	122,024	60,220	25,370	87,869
Salt [2].....do....	225,811	153,651	186,793	157,242	209,900
Sodium carbonate, crude.....do....	1,981	563			
Stone, for building.....cubic meters..	[3]	[3]	[4] 2,000,000	[4] 2,000,000	[4] 2,500,000

[1] Data furnished by Department of Mines and Quarries, Ministry of Finance, Egypt, through the United States consul, except as otherwise noted.
[2] Exports. Figures as published by Imp. Min. Res. Bur., London.
[3] Data not available.
[4] Approximate production.

ERITREA [20]

Gold, iron, limestone, manganese, petroleum, and salt are reported in Eritrea, but salt alone is exploited on a commercial scale. The most important mineral industry of the colony was based on the potash beds of Abyssinia, which lie about 10 miles inland from the Eritrean frontier. The mines were exploited by an Italian company under a 35-year lease from the Abyssinian Government. The potash was first brought to the port of Mersa Fatimari, on the Eritrean coast, and thence transported by sea to the port of Massawa for shipment abroad. The demand for potash for munitions stimulated the industry during the World War, but with the decline in demand and the lower prices after the armistice production declined, and the mines are now closed.

Three quartz gold mines have been worked in Eritrea, but operations were not profitable and the mines are now closed. The natives bring in small quantities of gold panned from stream beds, but further development of the gold-mining industry is unlikely unless deposits richer than those now known are discovered.

Several apparently extensive deposits of iron ore have been reported, the most notable of which is at Mount Ghedem, near Massawa. The deposit also contains manganese, but neither metal has been exploited.

Deposits of rock salt on the Dankali coast supply the native traders with the blocks used as a medium of exchange in Abyssinian trade. The salt of Eritrean commerce, however, is produced chiefly by solar evaporation of the water of the Red Sea, one plant alone at Massawa yielding an annual average of more than 40,000 tons.

Traces of petroleum have been found in the Dahlac Archipelago, just off the entrance to the harbor of Massawa, but no development work has been reported.

Limestone occurs at various places in Eritrea, and local kilns supply the building needs of the colony.

[20] Information supplied by A. E. Southard, United States consul, Aden, Arabia, 1920.

ESTONIA

Mineral production of Estonia, 1920–1924 [1]

Mineral	1920	1921	1922	1923	1924
Cement—tons	3,028	14,763	34,488	55,380	64,800
Clay (fire clay)—do	(2)	(2)	(2)	(2)	[3] 102
Gypsum—do	(2)	(2)	(2)	[3] 5,157	[3] 7,074
Oil shale—do	46,125	95,527	142,132	214,099	233,631
Oil, distilled from shale—do	(2)	(2)	(2)	[3] 359	[3] 412
Peat—cubic meters	(2)	(2)	42,982	65,646	135,172
Phosphate rock—tons	(2)	(2)	(2)	304	----------

[1] Statistique économique, Bureau Central de Statistique de l'Esthonie, except as otherwise noted.
[2] Data not available.
[3] Data furnished by the Bureau Central de Statistique, through the American consul, Tallinn.

FINLAND

Mineral production of Finland, 1920–1924 [1]

Mineral	1920	1921	1922	1923	1924
Asbestos—kilograms	252,391	749,517	784,980	(2)	(2)
Cement—tons	(2)	68,000	102,000	(2)	127,612
Copper:					
Ore—do	11,568	5,047	18,740	12,685	8,358
Metal [3]—do	460	220	750	507	368
Feldspar—do	55	957	1,322	(2)	(2)
Graphite—do	27	----------	----------	----------	----------
Iron:					
Ore—do	12,893	----------	1,187	(4)	(2)
Pig iron—do	12,961	7,080	13,072	9,257	10,653
Lime—do	128,080	141,568	202,510	105,376	[4] 277,648
Peat—do	11,426	15,165	(2)	10,114	12,795
Peat—cubic meters	9,981	88,867	(2)	10,868	8,580
Peat—bales	400,203	275,646	(2)	292,807	328,341
Pyrite—tons	----------	4,469	(2)	1,047	1,064
Quartz—kilograms	470,832	60,000	421,223	(2)	(2)
Zinc ore—tons	9,180	----------	----------	----------	----------

[1] Data furnished by the Industristyrelsen, Finland, through the United States consul, and by L. A. Davis, United States consul, Helsingfors.
[2] Data not available.
[3] Estimated copper content of ores.
[4] Official data of output not available, but production estimated at 1,000 tons.
[5] Includes marble.

FRANCE

Mineral production of France, 1920–1924[1]

Mineral	1920	1921	1922	1923	1924
Abrasives:					
Diatomaceous earth tons	3,830	4,580	4,620	4,550	2,300
Millstones do	19,247	19,300	19,105	16,690	26,827
Tripoli do	54	34		65	50
Whetstones, etc do	500	850	778	1,486	4,808
Aluminum do	12,304	8,382	7,494	14,343	16,315
Antimony:					
Ore [2] do	5,601	6,123	4,126	4,574	5,105
Oxide do	962	1,071	873	871	1,065
Regulus do	718	664	639	848	1,515
Sulphide do	645	61	139	376	415
Sulphuret, golden do	155	20	118	111	114
Arsenic:					
Ore do	3,736	5,087	4,465	10,022	14,029
Metallic arsenic do	9	10		5	
White arsenic do	447	216	266	815	802
Other arsenical products do	150	102	159	182	[3]
Asbestos do	445	500	610	664	882
Asphalt, crude do	25,024	39,595	48,477	40,071	51,465
Barite do	18,782	11,297	12,634	26,061	44,189
Bauxite do	266,716	95,318	236,141	393,736	388,692
Bitumen do				221	26
Briquets, fuel do	4,011,672	4,203,515	4,884,854	5,051,089	5,427,105
Cement do	1,453,996	1,686,219	2,213,210	2,517,560	3,200,759
Chalk do	48,320	40,400	31,656	55,080	67,313
Clay:					
Fire clay do	341,088	316,063	352,456	522,126	544,585
Kaolin do	65,729	64,512	79,204	94,576	111,281
Other clay do	14,577,214	4,665,125	6,151,787	7,540,417	7,755,648
Coal:					
Anthracite and bituminous do	24,293,223	28,211,839	31,141,096	37,679,314	44,011,240
Lignite do	967,835	748,634	772,014	877,123	944,080
Coke:					
Gas house do	1,880,853	2,285,425	2,337,635	2,471,675	2,450,874
Metallurgical do	1,761,418	1,860,706	2,362,280	4,287,109	5,414,664
Coke by-products:					
Ammonium sulphate do	57,579	44,454	53,552	78,583	[3]
Benzol do	10,205	12,482	17,350	30,461	[3]
Tar, crude do	288,253	269,392	295,470	374,834	[3]
Copper:					
Ore [4] do	553	228	1,806	495	265
Matte do	261	174	205	2,565	35
Metal, exclusive of matte [5] do	1,298	1,999	2,747	5,628	2,229
Feldspar do	4,400	4,625	2,000	4,980	5,800
Feldspathic rock do	4,700	2,250	10,221	7,629	8,313
Fluorspar do	8,997	5,776	9,251	12,913	23,047
Fuller's earth do	170	200	180	800	[3]
Gold-bearing ores [6] do	6,954	6,764	51,437	61,677	86,641
Gold grams	28,000	277,000	513,000	491,000	462,000
Graphite tons	272	1,100		190	514
Gypsum do	1,498,007	1,357,544	1,831,494	2,357,299	2,326,838
Iron:					
Ore do	13,921,820	14,200,937	21,106,112	23,349,379	29,044,149
Pig iron [7] do	3,344,414	3,446,799	5,276,802	5,467,872	7,692,565
Lead:					
Ore do	9,655	7,424	5,125	7,374	4,895
Metal [5] do	15,060	15,475	13,944	17,413	18,881
Lime, hydraulic do	1,349,917	1,410,746	1,614,063	1,896,161	2,355,915
Lithographic stone do		255			
Manganese ore [8] do	10,302	3,519	5,224	5,993	5,000
Marls, for agriculture do	506,362	399,595	394,524	533,234	443,330
Mineral black do	769	597	850	650	[3]
Mineral oil, distilled from shale do	4,800	4,203	4,900	4,520	5,560
Mineral paint ores: Ocher do	34,060	18,700	27,760	26,700	36,500
Nickel, metallic do	1,333	992	675	1,875	2,107
Oil shale, including bog head do	69,359	64,693	61,018	62,142	70,968
Peat, dry do	78,495	47,202	27,563	30,183	23,781

[1] Statistique de l'industrie minérale et des appareils à vapeur en France et en Algérie; Annales des Mines; data furnished by the Direction des Mines, France, through the United States consul, Paris.

[2] Antimony content reported as follows: 1920, 1,413 tons; 1921, 1,595 tons; 1922, 1,042 tons; 1923, 864 tons; 1924, not stated.

[3] Data not available.

[4] Copper content reported as follows: 1920, 29 tons; 1921, 37 tons; 1922, 53 tons; 1923, 30 tons; 1924, not stated.

[5] Smelter product, irrespective of source of material.

[6] Includes some auriferous mispickel which also appears under arsenic ore. The gold content of the ores reported as follows: 1920, 83 kilos; 1921, 91 kilos; 1922, 526 kilos; 1923, 626 kilos; 1924, not stated.

[7] Includes ferro-alloys.

[8] Manganese content reported as follows: 1920, 1,726 tons; 1921, 754 tons; 1922, 1,121 tons; 1923, 894 tons; 1924, not stated.

Mineral production of France, 1920–1924—Continued

Mineral	1920	1921	1922	1923	1924
Petroleum, crude tons	54,909	55,575	70,109	70,695	71,058
Phosphate rock do	124,929	111,984	146,526	179,462	206,859
Potash:					
Crude salts mined do	1,221,925	884,139	1,326,859	1,577,512	1,664,605
Merchantable products—					
Sylvinite, 12 to 16 per cent do	646,850	319,451	352,792	403,450	359,978
Sylvinite, 16 to 22 per cent do	330,541	247,006	329,623	370,811	449,385
Sylvinite, 30 to 40 per cent do				113,711	
Chloride, 50 per cent and over tons	62,243	85,017	193,999	151,533	241,263
Total in K_2O do	194,355	144,836	211,674	262,170	271,625
Pyrite, iron do	140,375	188,640	186,790	201,715	194,157
Salt:					
Rock salt and salt from springs do	840,001	793,151	1,083,197	1,188,586	1,317,908
Sea salt do	432,776	212,251	306,531	337,703	256,943
Sand:					
For foundries do	314,260	300,637	347,907	313,993	341,946
For glass factories do	119,978	160,241	221,158	347,516	338,675
Sand, silica, and gravel do	4,070,930	5,073,910	6,434,788	7,883,383	8,195,352
Slate do	246,751	222,903	255,529	280,672	290,666
Silver kilograms	10,986	12,220	10,800	13,991	28,940
Steel, crude (ingots and castings) tons	2,706,279	3,098,671	4,538,009	5,302,196	6,670,269
Stone:					
Building stone, dressed do	659,599	868,366	1,274,713	1,247,474	1,246,112
Granite do	167,548	128,417	41,420	31,220	23,490
Limestone, for agriculture do	267,490	250,050	365,099	377,285	477,470
Marble do	11,870	11,177	15,845	22,152	20,869
Other stone do	21,291,911	21,596,805	25,080,584	28,574,581	31,067,927
Sulphur rock do	1,101	284	65	272	897
Talc do	52,420	34,742	48,170	48,780	69,350
Tin:					
Ore [9] do	18	28			
Metal [8] do			91	22	6
Tungsten ores: Wolfram [10] do	3,745				
Zinc:					
Ore do	8,270	16,249	4,656	10,940	15,072
Metal [8] do	20,085	24,168	39,716	49,334	57,712
Zinc-lead ores do	5,580	7,741	35,131	45,030	62,932

[8] Smelter product, irrespective of source of material.
[9] Tin content reported as follows: 1920, 13 tons; 1921, 4 tons.
[10] Content of WO_3 reported as 21 tons in 1920.

FRENCH EQUATORIAL AFRICA (CONGO)

Deposits of copper, gold, iron, lead, manganese, salt, and zinc are reported in the French Congo,[21] but, so far as available records show, only the copper ores have warranted development. Rich deposits of copper ore, situated between Brazzaville and Loango, have been mined since 1911. The production for 1922 to 1924, the only recent years for which data are available, is reported as follows:[22] 1922, 438 tons, average copper content, 50 per cent; 1923, 225 tons, average copper content, 50 per cent; 1924, 647 tons, average copper content, 45 per cent.

FRENCH GUIANA

Deposits of bauxite, copper, gold, iron, lead, and quicksilver are reported in French Guiana,[23] but gold is the only mineral for which figures of production are available. The output of fine gold from 1920 to 1924 is given as follows:[24] 1920, 1,767,000 grams; 1921, 1,300,000 grams; 1922, 1,386,671 grams; 1923, 1,391,729 grams; 1924, 1,251,199 grams. French Guiana is the largest gold producer among the French colonies.

[21] L. de Launay, Les richesses minérales de l'Afrique. Paris, 1903.
[22] Data supplied by the Ministère des Colonies, France, through the United States consulate, Paris.
[23] Miller, B. L., and Singewald, J. T., jr., Mineral Deposits of South America. New York, 1919. Snyder, B. M., "Mining conditions in French Guiana": Eng. and Min. Jour., vol. 98, 1914, pp. 509–513.
[24] Figures for 1920 and 1921, Stat. de l'ind. min. France et Algérie, Paris; those for 1922 and 1923, furnished by Ministère des Colonies, France, through the United States consulate, Paris; and those for 1924, furnished by Chef du Service des Trav. Pub. et des Mines, French Guiana.

FRENCH WEST AFRICA

Deposits of bauxite, chromite, copper, gold, ilmenite, iron, manganese, and phosphate rock are reported,[25] but gold and ilmenite are the only minerals exploited to date. An output of 352 tons of ilmenite was reported from Senegal in 1924. The production of gold from the various colonies from 1920 to 1924 is given as follows:

Gold produced in French West Africa, 1920–1924, in fine grams [1]

Colony	1920	1921	1922	1923	1924
Guinea	(2)	(2)	332, 964	623, 270	219, 333
Ivory Coast			14, 962	30, 646	21, 250
Senegal and Niger			(2)	(2)	84, 239
Sudan			196, 826	137, 254	84, 239
Total	120, 000	460, 000	544, 752	791, 170	409, 061

[1] Data for 1920 and 1921, Statistique de l'ind. min. France et Algérie, Paris; those for 1922 and 1923, furnished by Ministère des Colonies, France; those for 1924, by Directeur des Affaires Économiques, Dakar, Senegal.
[2] Data not available.

FRENCH WEST INDIES

Guadeloupe.[26]—No minerals are produced in the island of Guadeloupe or its dependencies. Some iron ore has been found in the coast sands, but its commercial value is said to be negligible. Considerable quantities of sulphur are found in the vicinity of the Grande Soufrière volcano, but distance from the sea and lack of transport facilities render exploitation unprofitable.

Martinique.[27]—No minerals are produced on the island of Martinique. Large deposits of pumice are reported near Mont Pélée, but are not pure enough to be of commercial value.

GERMANY

Mineral production of Germany, 1920–1924 [a]

Mineral	1920	1921	1922	1923	1924
Arsenic ore [b] tons	6, 281	7, 033	8, 750	10, 273	10, 818
Asphalt, crude do	31, 904	29, 352	54, 619	46, 244	57, 359
Bauxite do	13, 420	10, 122	15, 150	6, 664	3, 085
Boracite do	86	92	133	101	207
Briquets, fuel [c] do	28, 809, 582	33, 794, 784	35, 179, 360	28, 795, 618	33, 759, 222
Bromine do	12, 827	1, 417	1, 378	1, 895	643
Cadmium do	21	22	2	1	1
Coal:					
Bituminous [d] do	140, 766, 397	145, 825, 965	141, 204, 597	71, 508, 409	132, 800, 868
Lignite do	111, 887, 694	123, 063, 811	137, 178, 830	118, 784, 997	124, 637, 201
Cobalt-nickel-bismuth-tin-antimony-vitriol ores tons	[e] 65, 481	15, 407	41, 475	40, 333	[f] 21, 517

[a] Vierteljahrshefte zur Statistik des deutschen Reichs; Statistische Uebersicht über die Kohlenwirtschaft. Data issued by the Statistisches Reichsamt in the Vierteljahrshefte do not cover all minerals produced in Germany, as is evident from the table below which gives the output of certain States as published by their respective mining bureaus.
[b] Data relate to ore and concentrates sold, the arsenic content of which is reported as follows: 1920, 2,077 tons; 1921, 2,342 tons; 1922, 2,958 tons; 1923, 3,363 tons; 1924, 3,499 tons.
[c] Includes output of the Saar. No production reported for the territory under French control since 1921.
[d] Includes the Saar.
[e] Includes some tin-tungsten ore.
[f] No production of vitriol ores reported.

[25] Information supplied by W. J. Yerby, United States consul, Dakar, Senegal, 1919.
[26] Information supplied by E. St. G. Lough, United States vice consul, Guadeloupe, 1922.
[27] Information supplied by T. R. Wallace, United States consul, Fort de France, 1922.

Mineral production of Germany, 1920–1924—Continued

Mineral	1920	1921	1922	1923	1924
Coke:					
Metallurgical [d] tons	26,342,265	29,078,013	31,022,480	14,203,569	25,100,888
Gas house do	4,075,323	4,787,156	5,042,109	4,418,756	4,300,000
Coke by-products: [h]					
Ammonium sulphate do	335,392	379,659	397,922	174,714	327,519
Benzol do	181,274	206,520	218,658	101,046	194,089
Tar [i] do	830,845	921,628	960,373	447,023	815,649
Copper:					
Ore do	576,211	622,534	719,488	766,946	791,602
Blister [j] do	6,494	20,716	12,521	587	453
Electrolytic do	21,283	25,953	28,274	27,309	33,310
Cement [j] do	3,146	1,924	2,667	2,417	2,320
Refined do	27,209	38,017	50,226	46,831	37,777
Glauber salts do	361	3,705	18,739	25,594	43,144
Gold, fine [k] kilograms	13,592	14,024	15,710	13,886	13,909
Graphite tons	20,639	24,565	32,342	20,856	10,079
Iron:					
Ore [l] do	6,354,344	5,903,190	5,922,698	5,107,731	4,453,547
Pig iron [d] do	7,351,625	9,003,770	10,350,517	5,961,505	9,221,671
Lead:					
Antimonial lead do	4,998	5,107	5,781	5,370	4,260
Soft lead do	65,505	80,740	77,781	50,740	63,167
Work lead do	10,617	11,995	12,821	15,419	14,868
Litharge [j] do	247	377	47	17	10
Magnesium chloride:					
Liquid do	44,023	27,778	48,309	28,059	29,139
Solid do	11,363	18,370	26,668	25,234	27,635
Magnesium sulphate [m] do	28,639	28,414	90,618	62,377	75,385
Manganese ore [n] do	7,270	3,385	5,532	10,245	3,554
Petroleum, crude do	35,359	36,247	44,158	49,985	57,791
Potash:					
Crude salts mined—					
Carnallite (including crude kieserite) tons	5,495,730	4,424,071	5,711,645	5,309,334	2,847,862
Kainite, sylvinite, etc do	5,894,436	4,772,071	7,367,802	6,039,090	5,243,255
Merchantable products—					
Carnallite, 9 to 12 per cent K_2O tons	538,478	379,297	447,209	264,122	170,319
Chloride do	680,388	344,919	458,862	472,862	341,503
Fertilizer salts do	1,010,803	1,187,679	1,853,911	1,491,605	1,332,407
Potassium sulphate do	46,073	45,122	93,812	125,598	108,263
Potash-magnesium sulphate do	31,767	11,485	44,805	42,089	46,948
Salts, crude, 12 to 15 per cent K_2O tons	2,726,160	2,066,758	2,314,122	1,375,372	1,193,503
Other salts do				7,317	15,321
Total in K_2O do	1,073,600	933,400	1,302,000	1,059,700	895,600
Pyrite, iron do	436,271	414,437	328,724	193,028	159,623
Salt:					
Rock do	2,596,825	1,655,753	2,684,318	1,583,978	1,596,416
Brine do	335,900	304,466	391,178	291,518	377,277
Silver, fine [o] kilograms	327,479	432,572	462,307	358,155	395,142
Tin, metallic tons	555	2,910	3,865	2,358	2,528
Tungsten ores: Wolfram do	[e] 1,394	10,327	9	[p]	[p]
Zinc:					
Crude do	61,811	59,744	[q] 35,942	34,557	40,209
Dust [j] do	22,957	19,520	[q] 24,374	18,493	18,279
Oxide [j] do					
Refined do	36,165	69,358	[q] 5,593	388	701
Zinc-lead ores [r] do	1,772,668	1,746,626	1,188,913	876,337	1,241,173

[d] Includes the Saar.

[e] Includes some tin-tungsten ore.

[g] Includes output of the Saar, but excludes the low-grade product from the distillation of lignite, shale, and peat, the production of which is reported as follows: 1920, 378,270 tons; 1921, 413,090 tons; 1922, 443,797 tons; 1923, 413,538 tons; 1924, 396,716 tons.

[h] Exclusive of by-products of gas-house coke, for which data are not available.

[i] Exclusive of the tar produced in the distillation of lignite, shale, and peat, the output of which is reported as follows: 1920, 63,151 tons; 1921, 67,867 tons; 1922, 74,921 tons; 1923, 77,591 tons; 1924, 74,721 tons.

[j] Production destined for sale.

[k] The estimated gold content of all ores raised in Germany is reported as follows: 1920, 137.69 kilograms; 1921, 129.69 kilograms; 1922, 168.95 kilograms; 1923, 199.52 kilograms; 1924, 226.08 kilograms.

[l] Exclusive of ores with an average manganese content above 30 per cent, which are listed under manganese.

[m] Includes some kieserite.

[n] Ores averaging above 30 per cent Mn.

[o] The estimated silver content of all ores raised in Germany is reported as follows: 1920, 102,781 kilograms; 1921, 105,363 kilograms; 1922, 107,719 kilograms; 1923, 116,734 kilograms; 1924, 138,343 kilograms.

[p] Commercial sources report some concentrates worked up from old dumps.

[q] Exclusive of that part of Upper Silesia allocated to Poland.

[r] Estimated metal content: 1920, lead, 49,816 tons; zinc, 158,123 tons; 1921, lead, 49,156 tons; zinc, 140,872 tons; 1922, lead, 31,359 tons; zinc, 56,909 tons; 1923, lead, 29,129 tons; zinc, 53,749 tons; 1924, lead, 36,502 tons; zinc, 58,443 tons.

Mineral production of Bavaria, Prussia, and Saxony, 1920–1924

State and mineral	1920	1921	1922	1923	1924
BAVARIA [1]					
Abrasives:					
Emery tons	140	243	420	400	350
Whetstones do	15	29	43	42	14
Antimony ore do	([2])	11	15	([2])	([2])
Asbestos do	28				
Barite do	7,888	23,439	16,139	19,970	23,029
Bitumen do	([3])	([3])	73	52	53
Cement marl do	32,097	20,229	32,611	19,956	54,867
Chalk do	26,461	12,881	16,266	13,070	19,310
Clay, fire do	455,446	374,172	276,464	221,286	251,596
Coal:					
Bituminous [4] do	92,178	84,353	84,312	61,821	33,779
Lignite do	2,437,633	2,523,666	2,658,311	2,573,019	2,387,601
Copper ore do	2,000	2,800	1,610		15
Feldspar do	5,850	7,249	6,080	8,986	33,138
Fluorspar do	6,272	7,210	13,221	10,543	21,663
Gold and silver ores do				4,011	1,344
Graphite do	20,447	24,565	32,342	20,788	10,079
Gypsum do	48,580	51,769	45,945	29,555	43,331
Iron:					
Ore do	451,326	451,993	526,806	468,336	373,689
Pig iron do	161,797	202,946	224,722	227,386	159,749
Kaolin do	194,485	226,629	258,555	270,980	357,842
Lithographic stone do	1,878	7,646	1,450	530	([2])
Mineral paint ores, ocher, etc do	10,608	9,570	4,765	3,731	7,974
Natural gas [5] cubic meters	([5])	([5])	([5])	([5])	([5])
Oil shale tons	[6] 1,069	[6] 379	33	1,202	530
Petroleum do	90	86	73	52	53
Phosphorite do	4,934	7,959	4,412	2,975	1,000
Pyrite and other vitriol ores do	7,771	7,178	8,518	6,873	6,638
Quartz and quartz sand do	274,091	273,559	331,660	353,085	527,982
Salt:					
Rock do	1,452	1,132	805	431	107
Brine do	41,062	30,945	40,475	29,262	31,648
Slate (roofing and slabs) do	306	932	2,298	485	210
Soapstone do	20,943	6,619	4,513	1,907	3,997
Stone:					
Basalt do	525,164	676,057	402,365	372,805	720,536
Granite do	491,495	335,878	1,611,324	186,529	566,779
Limestone, marble, and dolomite tons	930,182	1,331,229	1,292,098	1,046,327	1,711,410
Sandstone do	256,224	637,956	203,849	113,282	276,252
Trass do	12,451	2,846	9,400	11,700	13,700
Other stone do	396,907	669,392	357,814	216,472	380,757
Tin ore do	24		12		
Zinc-lead ore do	([2])	1,259	1,443	7,283	9,418
PRUSSIA [7]					
Amber, crude tons	290	219	356	504	501
Arsenic ore do	6,009	6,904	8,700	10,433	11,044
Asphalt do			2,500	2,750	3,750
Barite do	103,976	85,322	164,365	97,207	102,326
Bischofite do				2,404	3,064
Boracite do	89	75	104	66	44
Briquets, fuel [8] do	23,852,279	27,939,812	28,662,738	23,270,039	27,316,774
Bromine [8] do	9,165	885	815	1,588	505
Clay:					
Fire do	137,333	136,502	190,921	173,566	116,892
Other do	238,172	264,419	325,411	110,622	260,278
Coal:					
Bituminous [4] do	127,036,799	131,465,404	[9]127,314,375	58,187,931	114,732,086
Lignite do	91,969,783	101,149,606	112,555,242	96,038,058	101,429,121
Coke, metallurgical [10] do	25,741,274	28,479,378	29,754,985	13,456,155	24,256,216
Copper ore do	574,201	617,377	715,204	761,668	792,041
Fluorspar do	7,339	11,989	8,630	10,810	13,078
Glauber salts [8] do		2,150	3,899	4,588	12,375

[1] Source of data: Statistik über Bergbau, Steinbrüche und Gräbereien, Hütten und Salinen in Bayern; official data published in Glückauf.
[2] Data not available.
[3] Included under oil shale.
[4] Exclusive of the output of the Saar territory under French control.
[5] In the Danube-Inn section natural gas is known at many places and is used to a small extent for domestic heating and lighting, but there is no industrial or commercial utilization.
[6] Includes some bitumen.
[7] Source of data: Zeitschr. f. d. Berg-, Hütten- und Salinenwesen in preuss. Staate, except as otherwise noted.
[8] Figures published by Statistisches Reichsamt.
[9] Includes output of that part of Upper Silesia allocated to Poland up to the allocation of the territory.
[10] Exclusive of the low-grade product made in the distillation of lignite, shale, and peat, and of the output of the Saar territory under French control. Figures as published by the Statistisches Reichsamt.

Mineral production of Bavaria, Prussia, and Saxony, 1920–1924—Continued

State and mineral	1920	1921	1922	1923	1924
PRUSSIA—continued					
Graphite tons	40			68	
Gypsum: Alabaster do	50	2,976	1,327	507	442
Iron ore do	4,530,978	4,412,628	[9] 4,403,048	3,561,594	3,467,692
Langbeinite do					10,203
Lead ore do	91,377	95,464	[9] 71,426	58,856	91,095
Manganese ore do	766	341	614	338	317
Mineral paint ores do	2,287	1,480	1,336	2,322	1,791
Nickel ore do	16,050			3	
Petroleum do	34,955	38,303	41,922	50,718	59,299
Phosphorite do	1,927	925	657	2,311	399
Potash:					
Carnallite (including natural kieserite) tons	3,498,593	2,944,456	3,692,945	3,569,638	1,954,915
Kainite, sylvinite, etc do	4,171,890	3,567,016	5,382,378	4,445,694	3,814,459
Pyrite, iron do	398,426	377,121	[9] 294,302	154,537	116,357
Quartzite do		1,629	1,777	77	725
Salt:					
Rock do	1,476,228	768,746	1,327,333	768,977	640,650
Brine do	167,918	156,842	193,805	155,135	214,605
Sand do		1,293	1,143		165
Slate:					
Roofing meters	364,597	475,617	437,526	377,580	371,403
Slabs square meters	34,389	21,077	24,537	16,532	18,833
Stone:					
Basalt tons	296,643	373,503	413,093	198,932	162,542
Limestone do		1,470	30,799	19,190	21,090
Marble do			1,544	775	483
Trass do	99,911	25,415	62,686	76,917	88,195
Other stone do	16,536	13,928	17,977	6,304	7,747
Strontianite do	70	620	300		620
Zinc ore do	316,658	309,384	[9] 200,868	75,975	104,941
SAXONY [11]					
Barite tons					2,076
Bismuth-cobalt-nickel ores [12] do	162	176	127	104	102
Briquets, fuel do	1,812,401	2,272,678	2,505,498	2,303,716	2,602,909
Clay do	36,281	38,329	47,017	42,133	37,222
Coal:					
Bituminous do	4,050,722	4,510,310	4,192,622	3,783,010	3,817,284
Lignite do	7,654,851	8,178,262	9,052,473	8,214,186	8,958,490
Coke, metallurgical do	148,902	185,969	197,917	191,636	204,097
Copper-nickel ores do	650			9	
Fluorspar do	2,918	4,763	5,493	3,215	4,616
Iron ore do	6,344	2,515	2,877	4,150	1,760
Kaolin:					
Crude do	19,262	20,873	32,189	30,223	36,119
Slummed and sorted do	29,540	31,160	40,845	40,586	39,272
Lime do	18,418	22,392	24,087	24,037	30,894
Manganese ore do	31			21	33
Mineral paint ores do	52	80	97	59	3,107
Molybdenum ore kilograms	15				
Pyrite:					
Arsenical tons	401	237	6	42	192
Cupreous iron do			120	130	120
Quartz do	73	150	36	193	112
Quartzite do	5,992	5,602	3,570		
Sand, gravel, and broken stone do	29,837	39,021	54,695	8,839	5,592
Silver-lead ore [13] do	303	398	399	465	584
Stone:					
Limestone [14] do	11,475	13,275	13,844	14,520	34,052
Serpentine do	600	597	705	499	858
Tin ore [15] do	270	163	216	[16] 195	[16] 98
Tungsten ore: Wolfram [17] do	212	100	47	36	12
Zinc ore do	18		30	28	12

[9] Includes output of that part of Upper Silesia allocated to Poland up to the allocation of the territory.
[11] Source of data: Jahrb. f. d. Berg- und Hüttenwesen in Sachsen.
[12] Exclusive of tin-bismuth ores, which are included under tin ores.
[13] Includes some silver-bearing pyrite.
[14] Reported as "raw lime."
[15] Includes slimes and some tin-bismuth ores.
[16] Includes small quantity of tin-tungsten ore.
[17] Includes tin-bearing tungsten ores.

GILBERT AND ELLICE ISLANDS (BRITISH OCEANIA)

Phosphate rock is the only mineral produced in Gilbert and Ellice Islands. The exports for the years 1922 to 1924 are reported as follows: [28] 1922, 152,368 tons; 1923, 136,506 tons; 1924, 192,516 tons. Figures for 1920 and 1921 are not available.

GOLD COAST AND ASHANTI

Mineral production of the Gold Coast and Ashanti, 1920–1924 [1]

Mineral	1920	1921	1922	1923	1924
Gems: Diamonds—carats	215	1,789	6,535	23,342	53,035
Gold, fine—grams	6,454,159	6,326,293	6,615,399	6,205,922	6,404,300
Manganese ore (exports)—tons	41,628	7,311	67,174	141,875	259,441
Silver, fine [2]—kilograms	264	208	264	248	[3]
Tin ore, crude—tons	3				

[1] Government of the Gold Coast: Report on the Mines Department, except as otherwise noted.
[2] Estimated output. Figures of Imp. Min. Res. Bur., London.
[3] Data not available.

GREECE

Mineral production of Greece, 1920–1924 [a]

Mineral	1920	1921	1922	1923	1924
Abrasives:					
Emery—tons	11,089	12,709	13,000	21,626	23,000
Millstones—number	2,061		8,811	2,400	2,790
Antimony ore [b]—tons	146				
Arsenic, white—do	854	768	967	1,176	1,096
Bauxite—do					1,000
Bitumen—do	30				
Bituminous limestone—do	1,700	486	410	1,300	(c)
Chromite—do	7,382	8,029	9,213	14,828	14,651
Coal, lignite—do	197,454	168,576	131,515	117,927	129,530
Copper ore—do	72				
Gypsum—do	1,147	1,363	2,498	1,429	10,507
Iron ore—do	45,579	54,925	49,272	100,115	99,787
Lead:					
Ore [d]—do	23,582	23,475	38,963	53,565	70,921
Metal (work lead)—do	5,016	5,575	4,408	4,235	5,106
Magnesite:					
Crude—do	71,870	60,132	56,642	62,552	65,604
Calcined—do	2,356	12,857	9,668	20,136	20,386
Dead-burned—do		1,750		1,559	1,142
Manganese ore [e]—do					5,726
Manganiferous iron ore [f]—do	4			80	800
Pyrite, iron—do	3,239	49,625	54,510	52,290	76,262
Salt, from sea water—do	57,285	65,000	67,500	59,908	68,542
Santorini earth—do	10,388	29,014	27,620	57,774	79,722
Stone: Marble—cubic meters	1,316	1,253	(c)	2,093	(c)
Sulphur, crude—tons				2,243	2,594
Talc—do				132	139
Zinc:					
Ore [g]—do	2,604	1,920	1,149	4,026	4,861
Calcined calamine—do	2,136	1,940	1,822	8,302	4,188
Zinc-lead ore [h]—do	2,636	858	132	314	81

[a] Le mouvement minier de la Grèce, Dir. du Service des Mines, Greece; data furnished by the Service des Mines, through the United States consul, Athens.
[b] Antimony content reported as 25 to 60 per cent.
[c] Data not available.
[d] Average lead content reported as follows: 1920–21, 11 per cent; 1922–23, 9 per cent; 1924, not stated. The silver content averages about 149 grams per ton.
[e] Average manganese content reported as 43.6 per cent.
[f] Average manganese content reported as 12 per cent.
[g] Average zinc content reported as follows: 1920, 1921, 1923, 25.7 per cent; 1922, not stated; 1924, 24.5 per cent.
[h] Average metal content reported as follows: 1920, 1921, 1922, and 1924, Zn 11, Pb 11; 1923, Zn 10, Pb 11.

[28] Publications, Imp. Min. Res. Bur., London.

GREENLAND

Mineral production of Greenland, 1920–1924 [1]

Mineral	1920	1921	1922	1923	1924
Coal.....tons..	2,308	2,200	2,100	2,117	2,500
Cryolite.....cubic meters..	5,247	6,733	4,633	9,827	12,154
Graphite [2].....tons..	600	2,000	432	60	53

[1] Data supplied by the Director of the Greenland Colonies through the United States consul general, Copenhagen.
[2] Concentrated.

GUATEMALA

The mineral resources of Guatemala are known to include antimony, chromite, coal (lignite), gold, graphite, gypsum, iron, lead, manganese, marble, mica, ocher, petroleum, potash, salt, silver-lead, sulphur, talc, and zinc.[29] Many of the deposits have been worked intermittently and on a small scale for many years, but virtually no data on production are available.

The marble of the country is said to rival in quality that of Carrara, Italy. Prospecting for oil has been in progress several years, but no commercial production has been reported.

HAITI

There is no active mining in Haiti. Deposits of asphalt, bitumen, coal (lignite), copper, gold, iron, lead, manganese, and mercury have been reported, but none have been exploited to any extent, and no data on output are available. Salt is produced by the evaporation of sea water.

HONDURAS

Deposits of low-grade coal, of copper, gold, iron, petroleum, potassium nitrate, and silver are reported; but the known production is restricted to gold and silver, and is virtually represented by the output of the New York & Honduras Rosario Mining Co. This company reports production as follows for 1920 to 1924:

Gold and silver produced in Honduras, 1920–1924, in grams [a]

Metal	1920	1921	1922	1923	1924
Gold	279,962	72,316	135,518	145,595	137,664
Silver	53,228,911	20,442,763	44,941,389	63,395,457	68,023,033

[a] Ann. Repts., New York & Honduras Rosario Mining Co.

[29] Information supplied by A. C. Frost, United States consul, Guatemala City, 1922, and later consular and trade reports.

HUNGARY

Mineral production of Hungary, 1920–1924, in tons [1]

Mineral	1920	1921	1922	1923	1924
Antimony:					
Ore [2]	1,054				
Crude	10				
Regulus	216				
Bauxite [3]		[4]	[4]	500	192
Briquets, fuel				45,251	27,535
Coal:					
Bituminous	167,920	664,670	941,380	793,075	744,394
Lignite	4,795,140	5,753,290	6,776,230	6,894,958	6,333,286
Copper ore			35	52	120
Iron:					
Ore	101,665	36,015	45,909	138,123	101,750
Pig iron	[5] 30,000	71,387	[6] 117,000	124,445	115,502
Manganese ore [7]				403	1,217

[1] Data furnished by the Bureau of Mines, Ministry of Finance, Hungary, through the United States consul general, except as otherwise stated.
[2] Average antimony content reported as 11 per cent.
[3] Average content of Al_2O_3 reported as follows: 1923, 45 per cent; 1924, 47 per cent.
[4] Data not available.
[5] Commercial estimate.
[6] Figures published by Imp. Min. Res. Bur., London.
[7] Average manganese content reported as 30 per cent.

ICELAND

Deposits of lignite, iron ore, copper pyrite, Iceland spar, and peat exist in Iceland, and all have at some time been worked to a small extent, but in recent years only spar and peat have been produced. In 1920 there was no mineral production in Iceland. For the years 1921 to 1924, inclusive, the output of spar and peat was reported as follows: [30]

Mineral production of Iceland, 1921–1924

Mineral	1921	1922	1923	1924
Iceland spar, kilograms	600	100	1,750	1,200
Peat, tons		30,223	(a)	25,000

[a] Data not available.

[30] Data furnished by the Director of Mining Operations, Iceland.

INDIA (BRITISH)

Mineral production of British India, 1920–1924 [1]

Mineral	1920	1921	1922	1923	1924
Abrasives: Corundum ..... tons	213	65			
Alum ..... do	137	172	337	176	47
Amber ..... kilograms	3,658	1,321	203	2,438	4,521
Antimony ore ..... do	9	1,822			
Asbestos ..... tons	1,847	321	246	251	127
Barite ..... do	689	1,718	2,430	2,611	2,340
Bauxite ..... do	6,401	6,759	4,998	6,652	23,601
Bismuth ore ..... kilograms					36
Chromite, crude ..... tons	27,231	35,320	23,143	55,113	46,192
Clay ..... do	153,054	203,048	104,404	150,489	156,689
Coal ..... do	18,250,508	19,612,759	19,316,112	19,972,376	21,514,131
Coke [2] ..... do	365,465	276,927	327,676	307,764	371,944
Copper:					
Ore ..... do	28,619	33,113	31,298	6,655	[3]
Metal [4] ..... kilograms	520,218	1,161,345	1,053,644	190,001	2,982,107
Cyanite ..... tons					228
Fuller's earth ..... do	2,537	2,852	13,767	28,141	4,143
Gems:					
Diamonds ..... carats	85	126	171	115	67
Rubies, sapphires, and spinels ..... do	155,604	193,915	231,160	187,010	101,097
Other gem stones [5] ..... kilograms	20,706	4,851		3,470	
Gold, crude ..... grams	15,522,740	13,459,179	13,623,792	13,135,204	[6] 12,327,899
Graphite ..... tons	102	25	20		
Gypsum ..... do	34,089	34,344	41,354	39,928	38,735
Iron:					
Ore ..... do	566,961	957,204	635,310	834,231	1,468,510
Pig iron [7] ..... do	349,739	404,673	374,336	655,221	923,125
Jadeite ..... kilograms	174,200	193,810	392,446	184,259	133,609
Lead:					
Ore ..... tons	131,066	146,543	174,829	249,872	315,266
Metal [8] ..... do	24,203	34,258	39,843	46,799	[9] 51,370
Lime ..... do	61,759	96,977	56,669	64,086	16,933
Magnesite ..... do	14,577	20,338	19,582	19,748	24,854
Manganese ore ..... do	748,259	690,189	482,015	706,210	815,894
Mica ..... do	2,385	1,650	1,619	1,720	2,078
Mineral paint ores: Ocher ..... do	2,677	5,906	6,809	9,253	6,405
Molybdenite ..... kilograms	51	102			
Monazite ..... tons	1,667	1,280	127	250	[8] 632
Petroleum, crude ..... hectoliters	13,318,056	13,889,023	13,562,833	13,367,955	13,384,159
Phosphate rock ..... tons		353	1,362	4,838	6,529
Potash:					
Saltpeter ..... do	17,145	16,149	11,860	8,856	8,680
Other salts ..... do	51				
Salt:					
Rock salt ..... do	213,207	150,414	210,639	121,594	192,274
Other salts [10] ..... do	1,443,080	1,407,881	1,469,804	1,688,150	1,457,258
Samarskite ..... kilograms	152				
Silver ..... do	90,399	111,586	132,013	151,258	167,001
Slate ..... tons	56,995	53,057	40,424	13,504	13,615
Soda ..... do		10	28	[11] 7	[11] 15
Stone:					
Granite and gneiss ..... do	217,688	109,425	67,587	93,700	428,766
Limestone ..... do	968,170	1,682,959	1,195,600	1,504,861	1,881,171
Marble ..... do	7,161	9,279	3,921	5,052	5,708
Sandstone ..... do	164,637	405,003	149,561	289,603	452,891
Other stone ..... do	416,529	414,602	395,129	266,209	712,357
Talc and soapstone ..... do	3,915	8,178	4,830	7,137	2,898
Tin:					
Concentrates ..... do	2,153	1,729	1,905	2,039	1,996
Metal [12] ..... do	168	174	221		
Titanium ore (ilmenite) ..... do			406	711	651
Tungsten ore: Wolfram ..... do	2,384	912	958	886	751
Zinc concentrates ..... do	[13] 76	[13] 4,064	[13] 18,351	[13] 2,095	18,949
Zircon ..... do			163	147	371

[1] Records of the Geological Survey of India; Report of the Chief Inspector of Mines in India, Calcutta.
[2] Figures relate to coke made at collieries only.
[3] Data not available.
[4] Figures for 1920–1923 represent refined copper; those for 1924 matte, the average copper content of which is reported as 44.31 per cent.
[5] In 1920–21, stones represented, aquamarines and garnets; 1923, garnets and hyalite.
[6] Of this figure, 12,323,951 grams represent fine gold.
[7] Includes ferro-alloys.
[8] Smelter output.
[9] Exclusive of 1,200 tons of impure antimonial lead.
[10] Includes the following quantities produced in Aden: 1920, 184,082 tons; 1921, 159,097 tons; 1922, 207,308 tons; 1923, 171,999 tons; 1924, 182,058 tons.
[11] Exclusive of "trona," the salts obtained by evaporation from Lonar Lake in the Central Provinces, consisting in large part of sodium carbonate, sodium bicarbonate, and sodium chloride, the production of which is reported as follows: 1923, 610 tons; 1924, 20 tons.
[12] Block tin.
[13] Exports.

INDO-CHINA

Mineral production of Indo-China, 1920–1924[1]

Mineral		1920	1921	1922	1923	1924
Briquets, fuel	tons	[2] 55,553	([3])	[2] 30,933	[2] 46,413	75,211
Coal:						
Anthracite	do	659,617	865,615	919,645	1,001,433	1,170,570
Bituminous	do	33,464	42,847	63,595	50,064	60,745
Lignite	do	7,186	12,438	5,751	5,424	4,565
Gems:						
Sapphires	carats	3,413	3,480	4,719	4,889	4,144
Other	do					24
Graphite	tons					2,264
Iron ore	do	2,376				
Lead ore [4]	do		56	155	28	[5] 87
Phosphate rock	do	13,200	9,900	7,600	9,847	12,461
Tin:						
Concentrates [6]	do	365	566	525	474	620
Metal	do	197	313	250	301	334
Tin-tungsten ore [7]	do	([3])	([3])	153	175	198
Tungsten concentrates [8]	do	73	37	30	28	35
Zinc:						
Ore [9]	do	7,198	11,035	20,936	30,500	42,451
Metal (ingots)	do					72

[1] Data furnished by the Ingénieur en Chef des Mines, Indo-China, except as otherwise noted.
[2] Figures published by the Imp. Min. Res. Bur., London.
[3] Data not available.
[4] Lead content reported as follows: 1921–1923, 54 per cent; 1924, 50 to 58 per cent.
[5] Includes some silver-lead ore.
[6] Tin content reported as follows: 1920–21, 35 to 65 per cent; 1922, 71 per cent; 1923, 64 per cent; 1924, 60 to 65 per cent.
[7] Average content reported as follows: 1922, tin, 39 per cent; WO_3, 27 per cent; 1923, tin, 33 per cent; WO_3, 33 per cent; 1924, not stated.
[8] Average content of WO_3 reported as follows: 1920–21, 68 per cent; 1922, not stated; 1923–24, 70 per cent.
[9] Average zinc content reported as follows: 1920–21, 48 per cent; 1922, 45 per cent; 1923, 42 per cent; 1924, 40 to 43 per cent.

IRAQ (MESOPOTAMIA)

Petroleum is by far the most important mineral resource. The deposits are said to be rich and extensive and when fully developed will, it is confidently predicted, give Iraq a high rank among the petroleum-producing countries of the world.

The asphalt deposits of Hit, on the Euphrates, were much used in ancient times and are, with the exception of the famous lakes of Trinidad and Venezuela, the most remarkable known. Production by crude methods used by the natives is about 2,500 tons of asphaltic oil yearly, and persons who have visited the deposits say that this quantity can be greatly increased.[31]

Deposits of coal, gypsum, salt, and sulphur have been reported, but no data of production are available.

[31] Spieker, E. M., "Petroleum in Persia and the Near East": Eng. and Min. Jour., vol. 110, No. 7, 1920, p. 317.

ITALY

Mineral production of Italy, 1920–1924 [1]

Mineral	1920	1921	1922	1923	1924
Abrasives:					
Diatomaceous earth tons	25	875	175	420	420
Grindstones do	780	860	875	960	860
Honestones do	630	681	372	452	517
Millstones do	1,857	1,934	1,885	2,220	2,300
Pumice do	25,200	10,968	21,036	30,473	31,094
Aluminum do	1,238	744	810	1,473	2,058
Alunite do	3,445	1,171		135	852
Antimony:					
Ore [2] do	882	446	607	1,689	1,493
Oxide do			18	30	50
Regulus do			79	115	175
Sulphide, liquated do	80	28	112	150	160
Arsenic ore [3] do		60	450	206	147
Asbestos do	165	420	540	1,538	2,160
Asphalt and bituminous rock do	106,642	93,245	67,895	151,146	186,581
Barite do	15,380	13,500	21,300	27,592	39,568
Bauxite do	13,139	49,120	66,646	98,055	140,790
Bitumen, crude do	984	875	752	762	663
Boric acid do	1,719	2,491	2,448	2,478	2,695
Clay, for brick, tile, and pottery do	4,745,140	5,871,300	5,954,600	5,995,420	6,345,100
Coal:					
Anthracite do	28,402	22,926	26,423	9,640	11,825
Bituminous do	123,460	91,310	168,929	164,060	115,160
Lignite do	1,571,735	1,026,035	745,402	953,460	917,491
Coke, metallurgical do	95,727	34,022	167,953	275,235	309,971
Coke by-products:					
Ammonium sulphate do	1,047	485	1,484	3,037	4,023
Benzol do		160	310	500	400
Tar, crude do	3,550	1,740	4,153	6,296	7,204
Copper:					
Ore—					
Argentiferous [4] do	1,759	1,240	2,657	1,642	
Nonargentiferous [5] do	14,450	21,800	5,206	5,276	6,840
Ingots do	635	92		184	10
Cement copper do		339	409	398	444
Feldspar do	2,600	2,460	2,790	5,070	5,200
Fluorspar do	810	1,600	1,395	3,362	6,831
Gold, crude kilograms		2	9	38	48
Gold ores tons		80	560	1,356	1,500
Graphite do	5,398	5,233	4,546	5,691	7,740
Gypsum:					
Alabaster do	8,114	5,450	5,450	12,588	12,654
For calcining do	349,250	448,180	440,800	527,010	564,758
Other do	10,960	17,360	20,150	16,707	22,528
Ichthyol do	9	42	31	1	48
Ichthyolic shale do	800	1,830	690	50	450
Iron:					
Ore do	389,876	279,478	311,214	340,831	218,726
Pig iron [6] do	108,953	76,974	177,802	269,166	341,317
Kaolin and kaolinic earth do	19,323	9,095	7,687	9,761	34,185
Lead:					
Ore [7] do	3,929	2,904	2,481	2,730	2,314
Metal [8] do	15,947	12,494	10,710	17,131	22,062
Litharge do	4				
Lithographic stone do	300	166	100	200	400
Magnesite (giobertite) do	33,850	9,410	8,700	12,474	13,436
Magnesium sulphate do	1,200	350		1,800	1,700
Manganese ore [9] do	13,740	4,558	4,529	9,605	12,189
Manganiferous iron ore do	22,508	6,529	3,361	19,268	18,942

[1] Rivista del Servizio minerario, Rome.

[2] Average antimony content reported as follows: 1920, 26.5 per cent; 1921, 21.32 per cent; 1922, 30.15 per cent; 1923, 20.05 per cent; 1924, 31 15 per cent.

[3] Average arsenic content reported as follows: 1921, 38 per cent; 1922, 18 per cent; 1923, 22.43 per cent; 1924, 22 17 per cent.

[4] Average metal content per ton reported as follows: 1920, Cu 15 per cent, Ag 1,350 gr.; 1921, Cu 12 per cent, Ag 1,188 gr.; 1922, Cu 13 8 per cent, Ag 1,035 gr.; 1923, Cu 14.01 per cent, Ag 890 gr.

[5] Average copper content reported as follows: 1920, 4.86 per cent; 1921, 3.89 per cent; 1922–23, 6.25 per cent; 1924, 5.50 per cent.

[6] Includes ferro-alloys.

[7] Average lead content reported as follows: 1920, 72 per cent; 1921, 47.34 per cent; 1922, 70 per cent; 1923 71.34 per cent; 1924, 71.24 per cent. (See also silver-lead.)

[8] Smelter product.

[9] Manganese content reported as follows: 1920, 36.32 to 42.80 per cent; 1921, 34 to 42.80 per cent; 1922, 30 to 42.80 per cent; 1923, 33 to 50 per cent; 1924, 30 to 40 per cent.

Mineral production of Italy, 1920–1924—Continued

Mineral	1920	1921	1922	1923	1924
Mercury:					
Ore [10] tons			1,800	225	20
Metallic do	1,401	1,071	1,541	1,656	1,64
Mineral oil, distilled from coal, peat, and shale tons	1,842	1,307	204	1,800	2,42
Mineral paints:					
Ocher, umber, etc do	11,838	9,868	6,505	11,310	9,41
Red lead do	18				
Molybdenum ore [11] do	1	32	1	1	
Natural gas cubic meters	7,618,419	7,900,275	6,653,000	6,851,000	6,700,00
Nickel ore [12] tons		500	22	1,500	3
Oil shale do	16,325	3,030	5,476	5,662	2,98
Peat do	147,607	59,840	56,687	55,837	83,44
Petroleum, crude do	4,937	4,468	4,290	4,701	5,21
Puzzolan, broken lava, and scoria do	501,000	686,500	791,200	809,500	998,10
Pyrite:					
Cupreous [13] do	19,267	53,140	57,278	54,036	48,14
Iron do	302,322	394,759	428,722	439,235	467,63
Quartz do	63,480	25,320	37,074	37,571	57,69
Refractory materials do	40,127	44,695	48,779	60,445	64,18
Salt:					
Rock salt do	46,989	45,440	49,802	52,754	56,89
From springs do	22,026	45,331	86,572	89,322	152,50
From sea water do	653,103	422,820	653,935	622,570	597,91
Sand, gravel, and silica do	1,536,958	1,930,185	2,384,940	2,768,030	3,061,30
Silver kilograms	9,252	6,878	6,368	9,942	15,45
Silver-lead ore [14] tons	37,843	26,339	30,862	34,355	42,69
Slate do	15,490	14,080	19,330	21,520	19,11
Sodium sulphate do					2,30
Steel, crude (ingots and castings) do	773,761	700,433	982,519	1,141,761	1,358,85
Stone:					
Building and ornamental stone—					
Dressed do	1,258,343	1,189,140	1,127,900	1,053,450	1,074,23
Marble—					
White do	312,701	229,390	305,927	382,704	399,99
Colored do	39,720	49,140	55,514	53,822	68,40
Other building stones do	4,960,865	5,850,804	6,090,891	6,185,405	7,391,98
Leucite do	8,200	14,805	18,000	8,728	15,60
Limestone—					
For lime do	1,139,100	1,265,630	1,454,700	1,626,610	1,834,98
For other industrial uses do	1,551,755	1,487,946	1,777,632	2,590,452	3,594,76
Other stone do	28,970	30,174	48,930	80,481	77,35
Sulphur:					
Rock, crude do	[15]	[15]	[15]	[15]	1,927,90
Crude sulphur do	263,603	273,872	167,339	256,342	294,89
Ground rock do	32,496	28,861	22,706	9,466	22,30
Talc and soapstone do	21,495	21,070	26,524	31,189	32,20
Tin, ingots [16] do		50	60	60	6
Tungsten ore [17] do		20		1	
Zinc:					
Ore [18] do	95,985	63,493	94,956	132,596	151,47
Metal [8] do	1,177	527	3,082	3,681	5,95
Oxide do	1,302	249	715	1,033	1,76
Zinc-lead ore [19] do	570	325	668	1,711	85

[8] Smelter product.

[10] Data relate to the mineral district of Rome only. Average mercury content reported: 1922–23, 0.0 per cent; 1924, 0.8 per cent. Metallic quicksilver only is reported for the mineral districts of Florenc and Trieste, where the bulk of the Italian output is produced.

[11] Average content of MoS_2 reported as follows: 1920, 47 per cent; 1921, 8.71 per cent; 1922–1924, 90 pe cent.

[12] Average nickel content reported as follows: 1921, 2.5 per cent; 1922, 2 per cent; 1923–24, 3 per cent.

[13] Average copper content reported as 1 per cent.

[14] Average metal content per ton reported as follows: 1920, Pb 55.49 per cent, Ag 304 gr.; 1921, Pb 54.4 per cent, Ag 317 gr ; 1922, Pb 54.44 per cent, Ag 312 gr.; 1923, Pb 56.07 per cent, Ag 329 gr.; 1924, Pb 57.0 per cent, Ag 318 gr.

[15] Data not available.

[16] Output of detinning plant.

[17] Average content of WO_3 reported as follows: 1921, 20.3 per cent; 1923, 50 per cent.

[18] Average zinc content reported as follows: 1920, 40.71 per cent; 1921, 42.53 per cent; 1922, 42 per cent; 1923, 39.56 per cent; 1924, 38.49 per cent.

[19] Average metal content reported as follows: 1920, Pb 5 per cent, Zn 7 per cent; 1921, Pb 5 per cent, Zn 7 per cent; 1922, Pb 12.18 per cent, Zn 19.70 per cent; 1923, Pb 16.84 per cent, Zn 23.44 per cent; 1924, Pb 15.71 per cent, Zn 19.63 per cent.

JAPAN

Mineral production of Japan, 1920–1924[1]

State and mineral	1920	1921	1922	1923	1924
JAPAN PROPER					
Abrasives:					
Diatomaceous earth—tons	(2)	(2)	4,690	5,319	5,040
Garnet sand—do			3,405	3,586	3,530
Pumice—					
Sand—do			61,979	48,114	48,399
Volcanic ash—do			112,973	142,070	36,127
Alunite—do			1,178	19,255	10
Antimony ore—kilograms					41,760
Arsenic:					
Ore—tons	2,173	1,506	2,295	4,245	7,416
White arsenic—do	933	1,395	1,922	4,287	3,703
Asbestos—do	(2)	(2)	933	826	621
Asphalt:					
Natural—do	431	365	280		
Extracted from petroleum—do	6,500	6,574	7,389	6,454	8,681
Barite—do	(2)	(2)	48	47	
Bismuth, metal—kilograms	224	740	2,610	7,411	29,605
Cement[3]—tons	1,207,031	1,273,039	1,517,772	1,883,963	1,959,023
China stone and earths—do	(2)	(2)	273,866	423,602	468,782
Chromite—do	3,969	3,368	3,757	4,526	5,362
Clay:					
Fire clay—do	(2)	(2)	154,356	132,323	174,005
Other, for brick, tile, paper, etc.—do			[4] 2,436,810	2,486,862	2,320,415
Coal:					
Bituminous—do	29,245,384	26,220,617	27,701,731	28,948,820	30,110,826
Lignite—do	178,305	147,166	166,302	151,462	176,764
Coke:					
Natural—do	67,172	64,365	(2)	118,201	104,030
Metallurgical—do	903,225	668,550	720,554	658,053	832,429
Copper, metal—kilograms	67,792,344	54,092,200	54,126,274	59,345,713	62,583,134
Crystal, rock—do	(2)	(2)	19	19	
Feldspar—tons			16,051	22,940	23,427
Fluorspar—do			36		
Gems: Agate—kilograms			75	3,825	3,825
Gold—grams	7,718,904	7,374,668	7,526,816	7,691,141	7,600,286
Graphite—tons	1,133	900	1,046	801	767
Gravel—square meters	(2)	(2)	1,074,633	1,035,451	1,379,713
Gypsum—tons			54,038	34,275	43,093
Iron:					
Ore—do	203,559	19,935	(2)	(2)	(2)
Pig iron—do	168,870	96,648	478,088	530,536	473,308
Lead, metal—do	4,167	3,138	3,239	2,700	2,941
Manganese ore—do	5,474	3,881	4,440	5,494	7,585
Mercury, metallic—kilograms	2,684	5,950	1,205	4	
Mica—tons	(2)	(2)	15	431	592
Mineral paint ores: Ocher—do			374	585	304
Molybdenite, crude—do	89				
Natural gas—cubic meters	38,246,491	33,161,532	31,849,097	26,215,415	20,165,841
Petroleum, crude—hectoliters	3,517,935	3,537,590	3,245,407	2,841,615	2,848,756
Phosphate rock—tons	97,340	32,001	12,320	33,107	85,617
Platinum—grams	8,014	7,196	4,665	6,956	4,519
Pyrite—tons	138,409	94,987	161,503	226,067	220,456
Quartz sand—do	(2)	(2)	91,832	78,331	222,766
Quartzite and siliceous rock—do			34,073	37,447	49,640
Salt[5]—do	543,956	515,103	665,096	479,908	637,169
Silver—kilograms	152,162	130,254	123,152	111,890	110,179
Slate—cubic meters	(2)	(2)	18,743	35,904	26,903
Steel, crude—tons	308,214	325,300	367,367	495,433	529,856
Stone:					
Dolomite—do	(2)	(2)	23,613	23,414	16,992
Granite—cubic meters			[6] 402,904	348,565	337,560
Limestone, for building—do			53,867	22,156	18,150
Limestone, for cement—tons			1,923,028	1,759,305	2,373,783
Marble—cubic meters			3,936	1,479	2,442
Sandstone—do			[6] 102,879	133,276	134,472
Other stone[7]—do			493,931	460,607	493,442

[1] Stat. Com. and Ind., Min. Com. and Ind., Japan; Stat. Agri. and Forestry, Min. Agri., Japan; Econ. and Fin. Ann. Japan; Ann. Rept. on Admin. Chosen; Mining Industry of Japan; data furnished by the Governments of Chosen and Taiwan, respectively, through the American consuls at Keijo (Seoul) and Taihoku.

[2] Data not available.

[3] Computed on the basis of 170.54984 kilograms to the barrel.

[4] Exclusive of 34,978 square meters of clay, the weight of which is not reported.

[5] Data relate to the fiscal year ended Mar. 31 of year following that stated.

[6] Exclusive of a small quantity reported in tsubo. One tsubo=3.3 square meters.

[7] Exclusive of stone, unclassified, for which value only is given.

Mineral production of Japan, 1920–1924—Continued

State and mineral	1920	1921	1922	1923	1924
JAPAN PROPER—continued					
Sulphur:					
Ore tons	28,173	30,637	42,089	36,323	51,70
Refined sulphur do	41,605	36,551	34,642	37,416	46,87
Talc, soapstone, and agalmatolite do	(2)	(2)	49,003	35,918	41,86
Tin, metal do	205	294	287	305	34
Tungsten ore do	157				
Zinc:					
Ore [8] do	702,985	24,707	(2)	24,876	23,31
Metal do	15,745	10,374	12,526	13,780	14,06
CHOSEN					
Arsenic:					
Ore tons	(2)	(2)	56	26	
White arsenic do			(2)	95	
Clay: Kaolin do	1,662	5,996	3,069	2,319	2,49
Coal do	289,036	310,590	317,330	279,978	399,41
Copper:					
Ore do	(2)	(2)	(2)	65	65
Metal [9] kilograms	858,911	37,472	1,748		
Gold grams	3,296,228	2,669,696	3,325,691	3,779,025	4,171,85
Gold-silver ores and concentrates tons	28,387	22,663	15,142	(2)	(2)
Graphite do	11,212	7,213	15,042	14,267	14,94
Iron:					
Ore do	447,247	242,225	185,560	243,279	309,44
Pig iron do	85,168	83,273	83,221	99,933	99,79
Lead:					
Ore do	753			16	
Metal do	585				
Mica do		11	19	11	2
Molybdenite, crude do	2				
Salt do	54,921	56,000	45,000	40,200	(2)
Silica sand do	28,820	24,313	38,904	32,185	73,36
Silver kilograms	24	92	334	1,222	1,70
Sulphide ores [10] tons	1,747	3,255		16,498	20,78
Zinc ore do	3,483	141			1,051
KARAFUTO					
Coal tons	81,284	155,255	114,547	167,304	199,38
TAIWAN					
Coal tons	1,157,645	1,029,410	1,347,449	1,468,192	1,506,451
Copper:					
Ore do	5,038	6,081	6,384	4,682	23,654
Metal kilograms	692,270	1,196,890	1,095,508	706,895	227,280
Gold grams	567,810	881,625	683,730	419,955	269,141
Iron sand tons		19	84		
Petroleum hectoliters	12,216	11,949	20,765	25,289	35,781
Salt tons	51,976	101,540	138,000	239,000	136,200
Silver kilograms	558	792	730	570	73
Sulphur, crude tons	807	[11] 844	3,281	[11] 1,131	1,626

[2] Data not available.
[8] Figures incomplete, as data relate only to the more important zinc mines.
[9] Reported as "crude copper" in 1920; as "blister" in 1921 and 1922.
[10] Ores containing gold, silver, copper, lead, and zinc.
[11] Figures published by the Imp. Min. Res. Bur., London.

LATVIA

Consular and trade reports agree that Latvia is singularly poor in mineral deposits. The peat bogs are extensive, and a large quantity of peat is dug for domestic consumption, although no figures on production are available. Small deposits of dolomite, gypsum, and marl are worked to supply materials for the two cement plants of the country. Unimportant occurrences of clay, bog iron ore, and sandstone are reported.

LIBERIA

Liberia has no mineral industry worthy of note. Iron is worked by the natives, and gold in small quantities; tin, copper, zinc, monazite, corundum, lead, lignite, and diamonds have been found at various times in the interior but not as yet in paying amounts.[32]

LIBIA (TRIPOLI AND CYRENAICA)

Large deposits of sodium carbonate are reported near Fezzan in Tripoli, and there are occurrences of sulphur in the Syrt Desert in the northern part of the same Province, but information as to any development of these deposits is lacking.

The so-called phosphate rock deposits of Cyrenaica, at one time reputed to be rich and extensive, on closer examination were reported to be without commercial value.[33]

LITHUANIA

The Lithuanian Government says that no mines exist in Lithuania. The only mineral product of any importance is peat, the output of which in 1921 to 1924, is reported as follows:[34] 1921, 43,000 tons; 1922, 56,000 tons; 1923, 72,000 tons; 1924, 77,000 tons. Virtually all of the output is consumed in Lithuania; it is used in many factories and largely in private homes in Kovno.

LUXEMBURG

Mineral production of the Grand Duchy of Luxemburg, 1920–1924 [a]

Mineral	1920	1921	1922	1923	1924
Cement, tons	50,000	45,000	65,000	(b)	75,441
Iron:					
Ore, do	3,704,390	3,031,626	4,488,974	4,097,549	5,333,580
Pig iron, do	692,935	970,336	1,679,318	1,406,666	2,157,170
Gypsum, crude, cubic meters	15,694	8,182	17,566	25,970	29,500
Lime, do	(b)	14,671	24,777	20,237	19,186
Sand and gravel, do	31,763	28,208	50,256	85,502	71,000
Slate:					
Roofing slates, pieces	10,079,000	11,882,000	14,331,000	16,694,000	12,207,000
Sinkstones, do	163	149	248	177	351
Slabs, square meters	2,450	2,020	1,006	1,261	2,523
Steel, crude, tons	569,545	750,974	1,387,903	1,193,471	1,880,800
Stone:					
Building stone—					
Dressed, cubic meters	1,324	1,592	2,828	3,842	(b)
Other, do	37,957	41,877	62,019	75,705	(b)
Dolomite, do	18,574	11,542	14,200	16,593	13,628
Flagstones, square meters	115	271	210	50	(b)
Limestone, for lime, cubic meters	20,126	17,870	11,726	22,063	(b)
Paving stones, pieces	1,836,000	2,193,000	2,484,500	2,160,100	1,860,000
Road metal, etc., cubic meters	51,598	63,575	63,651	61,849	(b)
Other stone, do	261	465	873	336	(b)

[a] Luxemburg, Chambre de Commerce: Rapport général sur la situation de l'industrie et du commerce; Administration des Mines; Statistique et vue d'ensemble sur les industries extractives; data furnished by the Adm. des Mines, through the United States consular agent, Luxemburg.
[b] Data not available.

[32] Stateman's Year Book, London, 1926.
[33] Cortese, Emilio, Rassegna min. met. chim., vol. 52, pp. 41–42, 1920.
[34] Information furnished by C. M. Gerrity, United States vice consul, Kovno, 1926.

MADAGASCAR

Mineral production of Madagascar, 1920–1924[1]

[Exports]

Mineral	1920	1921	1922	1923	1924
Abrasives: Corundum ..... kilograms	521,461	285,013	185,743	420,756	146,9
Agate ..... do	30,000	5,000	5	.....	.....
Amazonite ..... do	3,200	3,858	2,582	5,120	15,8
Asbestos ..... do	1	143	4	(2)	.....
Auriferous quartz ..... do	.....	75	211	113	(3)
Bitumen ..... do	.....	.....	3	.....	.....
Columbite ..... do	.....	2	30	2,980	(3)
Copper ore ..... do	237	3,902	.....	9,000	(3)
Crystal, rock:					
Clear ..... do	2,596	634	3,075	4,372	16,8
Cloudy or opaque ..... do	41,862	145,464	113,697	93,211	116,8
Gems ..... do	3,982	15,826	11,755	6,227	18,7
Gold [4] ..... grams	518,772	456,241	577,659	502,819	428,8
Graphite ..... kilograms	14,424,994	6,220,238	6,675,464	10,767,757	11,556,0
Iron ore ..... do	34,834	43,846	23,728	.....	.....
Lead ore ..... do	.....	.....	35	26	(3)
Mica ..... do	49,521	140,710	91,964	165,127	286,4
Molybdenum ..... grams	951	.....	.....	.....	.....
Monazite ..... kilograms	.....	28	1	1,488	(3)
Nickel ore ..... do	100	.....	.....	.....	.....
Phosphate rock ..... tons	.....	.....	5,210	.....	7
Pyrite, iron ..... kilograms	.....	12	(2)	.....	.....
Quartz, colored or opaque ..... do	18,227	134	586	(5)	(5)
Rare earths ..... do	2,501	350	35	(3)	(3)
Talc ..... do	.....	500	.....	69	(3)
Titaniferous iron ore ..... do	.....	107	29	.....	(3)
Uranium ores:					
Betafite ..... do	5,149	5,941	15,592	14,938	4,9
Euxenite ..... do				5,423	1,2
Zircon for industrial uses ..... do	3,879	13,000	729	26,969	58,8

[1] Rapport sur le fonctionnement du Service des Mines, Madagascar, and data furnished by the Servic des Mines.
[2] Less than one-half kilogram.
[3] Data not available.
[4] Production.
[5] Included with opaque crystal.

MAKATEA ISLAND (FRENCH OCEANIA)

The mining of phosphate rock on the Island of Makatea, one o the Tuamotu group, about 100 miles north of Tahiti, is the onl mineral industry reported in French Oceania. The output for 192 to 1924 is reported as follows:[35] 1920, 32,000 tons; 1921, 60,000 tons 1922, 71,350 tons; 1923, 74,230 tons; 1924, 89,611 tons.

MALAY STATES

Mineral production of the Federated Malay States, 1920–1924 [a]

Mineral	1920	1921	1922	1923	1924
Cement ..... tons	5,538	1,796	498	1,192	.....
Coal ..... do	251,896	304,156	286,351	322,994	378,77
Gold, fine ..... grams	398,840	456,412	466,708	297,567	465,30
Stone:					
Limestone for cement ..... tons	7,490	6,145	1,494	.....	.....
Stone for roadmaking, etc ..... do	348,054	432,585	374,250	384,977	448,12
Tin:					
Tin in concentrates, exported [b] ..... do	31,390	30,404	29,874	32,304	37,89
Block tin, exported ..... do	4,106	4,639	5,978	5,950	6,85
Tungsten ores:					
Scheelite ..... do	122	.....	(c	.....	9
Wolframite ..... do	262	56	96	40	

[a] Report on the administration of the Mines Department and on the mining industries, Federated Malay States.
[b] Average tin content of concentrates reported as 72 per cent.
[c] Less than one-half ton (362 kilograms).

[35] Data for 1920 and 1921 furnished by H. F. Withey, United States consul, Tahiti, 1922; those for later years suppl ed by the Ministère des Colonies, France, through the United States consulate, Paris

Mineral production of the Straits Settlements, 1920–1924, in tons [1]

Settlement and mineral	1920	1921	1922	1923	1924
Christmas Island: Phosphate rock (exports)	70,692	87,893	100,947	71,563	127,166
Labuan: Coal mined					10
Malacca: Tin ore mined				9	2
Other settlements: Tin ore mined					7

[1] The Straits Settlements are the center of the great tin-smelting industry of the Malay Peninsula. The smelters are at Singapore and Penang. The only other mineral industry of note is the mining of phosphate rock on Christmas Island.

Data for Christmas Island furnished by the Eastern & Russian Trading Co. (Ltd.), through the United States consul general, London; those for the other settlements by the United States consul general at Singapore.

Mineral production of the Unfederated Malay States, 1920–1924 [1]

[Exports]

State and mineral	1920	1921	1922	1923	1924
Johore:					
China clay—tons				51	81
Iron ore—do		75,442	113,154	156,635	238,892
Tin concentrates—do	1,611	1,517	1,514	1,350	1,433
Kedah:					
Tin concentrates—do	482	[2, 3] 367	[3] 390	[3] 404	[3] 496
Tungsten concentrates—Wolfram—do	105	[2, 3] 1	[3] 51	[3] 63	[3] 120
Kelantan:					
Gold—grams					653
Tin concentrates—tons	2	4	3	1	
Perlis: Tin concentrates—do	[3] 263	[3] 243	[3] 467	[3] 363	[3] 529
Trengganu:					
Tin concentrates—do	491	406	438	481	853
Tungsten concentrates—					
Scheelite—do	155				
Wolfram—do		11	177	284	78
Total:					
China clay—do				51	81
Gold—grams					653
Iron ore—tons		75,442	113,154	156,635	238,892
Tin concentrates—do	2,849	2,537	2,812	2,599	3,311
Tungsten concentrates—					
Scheelite—do	155				
Wolfram—do	105	12	228	347	198

[1] Data for the several States furnished, except as otherwise noted, as follows: Johore, by the Warden of Mines, Johore; Kedah, by the Superintendent of Mines, Kedah, through the United States consulate, Singapore; Kelantan, Perlis, and Trengganu by the British advisers to the respective States, through the United States consulate, Singapore.

[2] Figures as published by the Imp. Min. Res. Bur., London, converted to metric tons.

[3] Period covered represents the Mohammedan year, which is as follows for the years under discussion: 1920, Sept. 26, 1919–Sept. 14, 1920; 1921, Sept. 15, 1920–Sept. 3, 1921; 1922, Sept. 4, 1921–Aug. 22, 1922; 1923, Aug. 23, 1922–Aug. 13, 1923; 1924, Aug. 14, 1923–Aug. 1, 1924.

MAURITIUS

So far as known, the production of sea salt is the only mineral industry on the island of Mauritius. The annual output of salt is estimated by the Imperial Mineral Resources Bureau, London, to be about 1,500 tons.

MEXICO

Mineral production of Mexico, 1920–1924 [1]

Mineral	1920	1921	1922	1923	1924
Antimony, metal [2] kilograms	622, 572	44, 545	463, 815	490, 087	774, 56
Arsenic (arsenious acid) do	2, 091, 704	784, 966	271, 718	1, 402, 357	2, 550, 75
Coal tons	715, 789	734, 980	932, 550	1, 261, 541	1, 226, 69
Copper, metal [2] kilograms	49, 192, 401	15, 228, 085	26, 977, 786	53, 371, 582	50, 061, 51
Gold, fine [2] do	22, 864	21, 275	23, 276	24, 162	24, 64
Graphite, amorphous do	3, 222, 941	2, 911, 093	2, 054, 279	5, 489, 198	8, 023, 41
Iron:					
Ore tons	(3)	(3)	(3)	50, 694	52, 44
Pig iron do	15, 480	41, 540	23, 769	21, 210	19, 48
Lead, metal [2] kilograms	82, 517, 598	60, 513, 232	110, 455, 912	155, 720, 342	165, 062, 78
Manganese ore tons				2, 246	1, 80
Mercury, metal [2] kilograms	75, 748	46, 245	41, 897	44, 751	36, 66
Molybdenum concentrates do	4, 230	3, 230	7, 288	1, 335	3, 82
Petroleum, crude hectoliters	24, 971, 398	30, 747, 111	28, 979, 348	23, 781, 590	22, 206, 60
Selenium, metal [2] kilograms				374	21
Silver, fine [2] do	2, 068, 938	2, 005, 143	2, 521, 832	2, 824, 599	2, 844, 10
Steel, crude tons	32, 291	43, 263	52, 726	59, 216	37, 61
Tin, metal [2] kilograms		492			8, 84
Tungsten ore do	40, 020	14, 396			
Vanadium ore do		559		10, 000	
Zinc:					
Ore do	(3)	(3)	(3)	41, 819, 059	58, 598, 65
Metal [2] do	15, 650, 590	1, 256, 986	6, 341, 937	18, 481, 348	24, 659, 15

[1] Departamento de Minas, Mexico, Anuario de estadística minera; Boletin del Petroleo.
[2] Estimated metal content of ores, concentrates, etc.
[3] Data not available.

MOROCCO

French Morocco.—At present the mining of phosphate rock is the leading mineral industry of the French zone of Morocco; the deposits are rich and extensive. The industry first came into prominence in 1921, and production data for earlier years are not available.

Deposits of copper, iron, lead, manganese, salt, tin, and zinc are also known, and in 1924 a small output of copper, lead, and zinc ores was reported as the result of prospecting operations in that year. The mineral production of French Morocco, so far as known, is shown in the following table:

Mineral production of French Morocco, 1920–1924 in tons [1]

Mineral	1920	1921	1922	1923	1924
Cement		8, 640	1, 200	20, 300	(2)
Copper ore					[3] 120
Lead ore					[4] 1, 100
Lime, hydraulic		6, 420	7, 600	13, 100	(2)
Manganese ore	4, 375	(2)	(2)	(2)	[5] 400
Phosphate rock [6]		33, 000	96, 397	225, 395	461, 582

[1] Statistique de l'ind. min. France et Algérie, Ministère des Travaux Publics, France, and data supplied by the Ministère des Colonies, France, through the United States consulate, Paris, except as otherwise stated.
[2] Data not available.
[3] Average copper content reported as 8 per cent.
[4] Argentiferous ore. Average metal content reported as 70 per cent.
[5] Average content of MnO_2 reported as 85 per cent.
[6] Figures from Ann. Rept of the Office Chérifien des Phosphates, Morocco, supplied by the United States consul, Casablanca.

Spanish Morocco.—Deposits of antimony, copper, iron, lead, phosphate rock, silver, and zinc are known, and the beds of iron are reported to be very rich and extensive.[36] Iron, lead, and zinc mines

[36] Information supplied by Maxwell Blake, United States consul general, Tangier, 1922.

have been worked for several years, but data of production are available only for iron and are as follows for 1920 to 1923:[37] 1920, 211,886 tons; 1921, 115,807 tons; 1922, 300,000 tons; 1923, 397,000 tons.

NAURU AND OCEAN ISLANDS (BRITISH OCEANIA)

The only mineral production reported from Nauru and Ocean Islands is that of phosphate rock. The deposits are large. The output in 1921 to 1924 is reported as follows for the fiscal years ended June 30 of the year stated:[38] 1921, 370,097 tons; 1922, 367,000 tons; 1923 (exports), 318,794 tons; 1924 (exports), 459,162 tons.

NETHERLANDS

Mineral production of the Netherlands, 1920–1924 [1]

Mineral [2]	1920	1921	1922	1923	1924
Briquets, fuel ..... tons	633,930	585,266	626,432	473,579	562,181
Coal:					
Bituminous ..... do	4,115,629	4,243,000	4,866,371	5,595,478	6,180,182
Lignite ..... do	1,395,851	121,715	28,919	54,185	191,202
Coke:					
Gas house ..... do	569,200	609,826	664,993	[3] 700,000	[3] 750,000
Metallurgical ..... do	130,987	228,605	451,758	671,687	975,779
Salt, rock ..... do	24,857	25,465	28,334	26,813	32,054
Stone:					
Limestone—					
For building ..... cubic meters	6,900	7,591	5,304	3,217	3,571
For fertilizer ..... tons	19,900	2,655	6,429	3,390	4,378
For lime burning ..... do	5,150	30	620	100	642
Zinc, spelter [4] ..... do	2,031	6,405	12,997	16,440	18,190

[1] Jaarverslag van den Hoofdingenieur der Mijnen, Netherlands, except as otherwise stated.
[2] In addition to the minerals listed, peat is produced in the Netherlands, but annual data of output are not available. The most recent statistics published relate to the year 1915, in which year the more important peat bogs produced 1,300,788,000 blocks of peat for fuel and 464,278,000 blocks for other purposes (Jaarcijfers v. h. Koninkrijk d. Nederlanden, 1918).
[3] Official estimate of output.
[4] Data furnished by Cie. Anonyme des Zincs de la Campine, through the United States consul, Rotterdam. The product is made entirely from foreign material, as no zinc ore is mined in the Netherlands.

NETHERLANDS EAST INDIES

Mineral production of the Netherlands East Indies, 1920–1924 [a]

Mineral	1920	1921	1922	1923	1924
Asphalt rock ..... tons	.....	.....	.....	.....	650
Briquets, fuel ..... do	.....	.....	.....	12,387	28,373
Coal:					
Bituminous ..... do	1,095,439	1,211,465	1,040,678	1,156,625	1,446,757
Lignite ..... do	279	1,200			
Gems: Diamonds ..... carats	410	1,770	1,948	1,140	3,485
Gold, fine ..... grams	2,763,344	2,929,101	3,642,158	3,594,697	3,869,289
Iodide of copper ..... tons	16	21	3	.....	.....
Manganese ore ..... do	4,179	2,093	3,233	5,243	8,482
Natural gas ..... do	188,736	88,192	103,053	223,063	283,505
Petroleum, crude ..... do	2,365,318	2,361,507	2,382,398	2,833,048	2,925,768
Salt ..... do	135,660	133,522	170,246	150,636	132,026
Silver, fine ..... kilograms	31,753	31,789	38,727	49,105	64,799
Stone:					
Limestone, for building .. cubic meters	1,500	3,151	1,000	2,400	2,400
Tuff ..... do	[b]	5,795	[b]	2,364	5,909
Tin, metal ..... tons	21,952	27,342	29,722	29,560	32,418
Tin-tungsten ore ..... do	322	159	.....	20	329
Trass ..... do	19,000	18,000	9,085	10,171	5,120

[a] Jaarboek v. h. Mijnwesen in Ned.—Indië; Stat. Jaaroversicht v. Ned. Indië; Jaarcijfers v. h. Kon. Ned. (Kolonien).
[b] Data not available.

[37] Publications, Imp. Min. Res. Bur., London.
[38] Data for 1921 and 1922, Official Yearbook of the Commonwealth of Australia; those for 1923 and 1924 furnished by the British Phosphate Commission, Melbourne, through the United States consul general, Melbourne.

NETHERLANDS WEST INDIES

Phosphate rock and marine salt were the only minerals produced in the Netherlands West Indies in 1920 to 1924, inclusive. The islands of Aruba and Curação formerly produced some gold, but no output of the precious metal has been reported in recent years. The phosphate beds of Aruba, also, have not been worked for some time. The mineral output of the colony in the years under review follows:

Mineral production of the Netherlands West Indies, 1920–1924, in tons [1]

[Exports]

Island and mineral	1920	1921	1922	1923	1924
Aruba: Salt, from sea water		5			
Bonaire: Salt, from sea water	13,974	7,704	6,397	2,950	2,620
Curação:					
Phosphate rock	61,440	60,872	50,078	85,855	100,471
Salt, from sea water	4,846	2,756	5,730	2,382	65
St. Martin: Salt, from sea water	6,633	7,344	6,332	6,463	6,209
Total: Phosphate rock	61,440	60,872	50,078	85,855	100,471
Salt, from sea water	[2] 25,453	[2] 17,809	18,459	11,795	8,894

[1] Data furnished by the governor, Willemstad, Curação. Figures relate to exports, as statistics of output are not available.
[2] Figures as published in Jaarcijfers v. h. Koninkrijk d. Nederlanden are as follows: 1920, 25,524 tons; 1921, 17,810 tons.

NEW CALEDONIA

Mineral production of New Caledonia, 1920–1924, in tons [1]

Mineral	1920	1921	1922	1923	1924
Chromite [2]	31,280	22,900	13,000	23,220	23,021
Cobalt ore			300	64	[3]
Copper ore				82	[3]
Gypsum	13,403	11,300	12,000	[3]	[3]
Manganese ore	2,244	4,200	1,083	64	
Nickel:					
Ore	81,166	74,100	45,000	11,189	75,718
Matte [4]	[3]	[3]	4,666	3,509	4,042
Phosphate rock [5]	11,421	5,000	5,142	12,932	[3]
Silver-lead ore				1,630	[3]

[1] Statistique de l'industrie minérale en France et en Algérie, Paris, and data furnished by Ministère des Colonies, Paris, and the Governor of New Caledonia.
[2] Average content of chromic oxide reported as 52 per cent.
[3] Data not available.
[4] Average nickel content reported as follows: 1921, not stated; 1922–23, 45 to 75 per cent; 1924, 76 per cent.
[5] Phospho-guano collected from two small island dependencies of New Caledonia.

NEWFOUNDLAND

Mineral production of Newfoundland, 1920–1924, in tons [1]

Mineral	1920	1921	1922	1923	1924
Coal		[2] 6,000			
Copper ore		3		3,000	9
Iron ore	[3] 599,922	522,456	1,014,490	936,369	665,633
Manganese ore		384			
Stone: Limestone	130,964	94,900	200,220	223,559	76,796

[1] Data furnished by the Deputy Minister of Agriculture and Mines, Newfoundland, except as otherwise noted.
[2] Mined during exploration of coal areas.
[3] Figures as published by Dominion Bur. Statistics, representing shipments from the Wabana Mines.

NEW GUINEA, TERRITORY OF [39]

Little mining has been done in the Territory of New Guinea, and knowledge of the mineral resources is scanty. The following minerals have been reported: Coal (lignite), on the mainland and in the southern part of New Ireland; copper, in the form of chalcopyrite and malachite; gold, alluvial deposits and a few quartz veins; iron, hematite and magnetite, apparently in large quantities; lead, in the form of red oxide; mica, in fairly large sheets; osmiridium and platinum; petroleum, known but not yet found in paying quantities; phosphate rock, on the Purdy Islands; and sulphur, in several localities. Tin has been reported, but its occurrence has not been investigated.

In the year ended June 30, 1924, gold amounting to 205,812 grams was exported, all from the Morobe gold fields.

NEW ZEALAND

Mineral production of New Zealand, 1920–1924 [1]

Mineral	1920	1921	1922	1923	1924
Asbestos kilograms	1,778	254			
Clay, for brick, tiles, etc tons	1,626	2,225	(2)	(2)	(2)
Coal:					
Bituminous do	938,398	908,191	983,981	950,715	1,102,418
Lignite do	934,898	929,940	903,656	1,050,735	1,014,224
Gold, fine [3] grams	6,624,202	4,652,925	4,100,932	5,272,413	4,156,389
Iron:					
Ore tons	(2)	(2)	(2)	(2)	2,550
Pig iron do			82		640
Lime [3] do	15	49	17		
Manganese ore [3] do	2			8	6
Mercury kilograms	1,667	714	711		
Petroleum, crude liters			39,484		31,800
Phosphate rock tons	5,427	6,108	3,178	2,421	1,600
Pumice:					
Sand do	2,783	2,992	3,004	[3] 3,719	[3] 1,655
Stone do	106		64	[3] 57	
Silver [3] kilograms	11,490	14,930	13,783	16,008	17,985
Stone:					
Building and monument tons	19,328	11,819		35,011	19,482
Limestone—					
For agriculture do	144,535	125,783	(2)	105,228	140,961
For cement, etc do	172,681	183,652		145,547	265,145
Other stone do	910,099	879,797		1,199,543	975,143
Sulphur, crude do	758	888			
Tungsten concentrates: Scheelite kilograms	39,727	39,016		5,537	3,048

[1] New Zealand, Minister of Mines: Mines statement; data supplied by the Minister of Mines, through the United States consul general.
[2] Data not available.
[3] Exports.

NICARAGUA

Deposits of copper, gold, manganese, mica, petroleum, salt, silver, and titaniferous iron ore have at various times been reported, but the mineral production has been limited to gold and silver. Data on the output of these metals are not available.

[39] Official Year Book of the Commonwealth of Australia, Nos. 15 and 18, Melbourne, 1923 and 1926.

NIGERIA

Mineral production of Nigeria, 1920–1924 [1]

Mineral [2]		1920	1921	1922	1923	1924
Antimony ore [3]	kilograms	744	311	791	(4)	(4)
Coal	tons	183,013	216,262	[3] 123,027	193,644	235,8
Gold, fine [5]	grams	22,519	6,781	21,835	29,424	44,8
Tin concentrates	tons	8,040	7,341	[3] 8,251	8,509	8,9

[1] 1920–1922, inclusive, data furnished by W. J. Yerby, United States consul, Dakar, Senegal; 1923 an 1924, data furnished by C. E. Macy, United States vice consul, Dakar.
[2] In addition to the minerals listed, small quantities of iron ore and salt are produced from native work ings, for which no figures are available. The output of neither mineral supplies domestic requirements.
[3] Exports.
[4] Data not available.
[5] Figures as published by the Imp. Min. Res. Bur., London, converted from ounces to grams.

NORWAY

Mineral production of Norway, 1920–1924 [1]

Mineral		1920	1921	1922	1923	1924
Abrasives: Diatomaceous earth (exports) [2]	tons	75	113	82	110	6
Aluminum	do				13,319	19,95
Copper:						
Ore	do	6,809	14,135	1,059	2,352	2,03
Metal	kilograms	[3] 555,880	1,348,439	79,817	67,453	71,30
Feldspar:						
Ground (exports)	tons	2,160	781	2,132	2,218	4,52
Unground (exports)	do	4,237	8,567	9,701	10,855	16,35
Graphite	do	10				
Iron:						
Ore	do	79,208	54,975	258,815	385,836	522,12
Pig iron [4]	do	5,771	2,509	3,759	26,395	64,95
Lead	do				242	64
Magnesite, crude	do			738	2,359	1,97
Molybdenum ore	do				39	7
Nickel:						
Ore	do	12,482	2,141	3,050		
Metal	do	422			71	
Phosphate rock (apatite)	do		1,068		222	345
Pyrite:						
Arsenical	do				577	
Cupreous iron	do	333,011	231,123	396,411	375,161	403,41
Rutile	do	40	20	78	60	27
Silver:						
Ore	do	8,018	8,832	11,764	12,521	19,868
Bars	kilograms	10,052	6,100	6,381	9,267	13,200
Sodium, metallic	tons					507
Steel, crude	do					2,252
Talc	do		2,810	7,821	8,907	11,785
Titaniferous iron ore	do	3,378	2,567	3,300	2,620	3,472
Zinc:						
Ore	do	148	7	552	2,226	1,389
Metal	do	[5] 1,837	[5] 2,000	[5] 1,850	3,783	5,024

[1] Statistiske Centralbyrå, Oslo: Norgesbergverksdrift, except as otherwise stated. The mineral resources of Spitsbergen should also be taken into account, as the islands of that group now belong to Norway.
[2] Figures as published in Norges Handel.
[3] Of this quantity, 205,880 kilograms represent cement copper.
[4] Includes ferro-alloys.
[5] Figures of American Bureau of Metal Statistics.

NYASALAND PROTECTORATE [40]

The mineral industry of Nyasaland has not attained commercial importance, but a long list of economic minerals has been reported and additions to the list are made continually as the country is further investigated. The deposits now known include abrasive corundum

[40] Dixey, F., Geology and Mineral Resources of Nyasaland. London, 1926.

and garnet, asbestos, barite, bauxite, clay, coal, copper, gold, graphite, gypsum, iron, manganese, mica, monazite, phosphate rock, platinum, silver-lead, strontianite, talc, and tin. The coal of the Lower Shire area and the bauxite of the Mlanje Mountains are already attracting the attention of mining interests. The flake graphite of Angoniland, reported to be of excellent quality, and the gold, mica, and corundum of other areas will doubtless become of greater interest as transport facilities improve. Alluvial deposits of gold are widely distributed. Manganese is found in the form of a low-grade manganiferous iron ore. No data of production are available.

PALESTINE

With the exception of petroleum, the mineral resources of Palestine are not believed to be potentially important.

Asphalt and bituminous limestones occur throughout Syria and Palestine, and many of the deposits in Palestine were important sources of oil and asphalt in ancient times. Drilling in the valley of the Jarmu, a tributary of the Jordan, just before the outbreak of the World War, is said to have disclosed petroleum at a depth of 400 meters.[41]

Deposits of asphalt, bitumen, copper, gypsum, iron ore, phosphate rock, salt, sulphur, and talc are reported, but data on annual output are lacking.[42]

Asphalt of very pure quality comes ashore along the western and the southern coast of the Dead Sea after heavy weather. Three fields of bitumen are known and also one deposit of gypsum. Iron ore of poor quality is reported in Transjordania. Three fields of phosphate rock are known, that of Es-Salt being the most important. Approximately 6,000 tons of marine salt are produced annually near Haifa, and in addition there are two other important potential sources of salt, namely, the waters of the Dead Sea and a large body of very pure rock salt on its southwestern edge. Copper is authoritatively said to have been mined and worked in Transjordania in ancient times. Sulphur and talc deposits have been located.[42]

PANAMA

Deposits of copper, gold, iron, limestone, manganese, and silver are known, but the only mining operations worthy of note are gold mining in the Darien district and manganese mining in the Province of Colon. At the present time only manganese is being mined. Data on production are not available.[44] In 1920 about 1,100 tons of manganese were exported from deposits in the vicinity of Mandingo Bay.

Limestone is plentiful and lime is produced in small quantities. Large quantities of salt are produced from sea water by solar evaporation, mostly by natives using primitive methods.[45]

---

[41] Spieker, E. M., Petroleum in Persia and the Near East: Eng. and Min. Jour., vol. 110, 1920, pp. 316–323.
[42] Information supplied by O. S. Heizer, United States consul, Jerusalem, 1926.
[44] Information supplied by H. D. Myers, United States vice consul, Panama, 1926.
[45] Information supplied by G. Orr, United States consul, Panama, 1922.

PAPUA

Mineral production of Papua, 1920–1924[1]

Mineral	1920[2]	1921[2]	1922[2]	1923[2]	1924[2]
Copper:					
Ore (exports)—tons	[3] 10	259	2,743		
Matte (exports)—do				[4] 1	[4] 8
Gold, crude—grams	365,497	411,561	1,639,278	529,786	67,370
Iron ore (exports)—tons	10				
Osmiridium—grams	3,110	11,197	3,110	[5] 4,510	[5] 3,701

[1] Annual Report of the Lieutenant Governor, Territory of Papua.
[2] Fiscal year ended June 30 of year stated.
[3] The production of copper ore in 1920 is reported as 7,840 tons Similar data are not available for subsequent years.
[4] Average copper content reported as follows: 1923, 24 per cent; 1924, 25 per cent.
[5] Exports.

PARAGUAY

Although many useful minerals occur in Paraguay, the mineral industry of the country is little developed. Iron is widely distributed and abundant, and many deposits of copper are reported in the Cordilleritas and of manganese near Encarnación. It is claimed that mercury has been found near Ascunsión and zinc, gold, and silver in the Cordilleritas, but the existence of the deposits has not been satisfactorily established. Other useful mineral resources found embrace glass sand, gypsum, kaolin, marble and other building stones, nitrates, ocher, quartzite, and talc.[46]

PERSIA

Persia is generally regarded as having vast deposits of petroleum and these overshadow other mineral resources that are varied and large.

The output of crude petroleum, the only mineral for which production data are available, was as follows in 1920 to 1924, in hectoliters: 1920, 19,440,000; 1921, 26,507,000; 1922, 35,369,000; 1923, 40,112,000; 1924, 51,468,000. These figures do not include quantities consumed in the field, for which no statistics are available.

Numerous mines are now being worked in Persia, and the following ores and minerals are being produced in fairly large quantities: Alum, arsenic, coal, copper, graphite, iron oxide, lead and silver-lead, salt, soda, sulphur, and turquoise. Mining methods in use, however, are more or less primitive, and output is seldom commensurate with resources. In addition to the minerals known to be mined, deposits of asbestos, borax, lapis lazuli, manganese, and nickel have been reported.[47]

[46] Graty, Alfredo du, Historia del Paraguay. Excerpt published in Bol. Dir. Tierras y Colonias, Año 5. No. 25, Ascunsión, 1925, pp. 1161–1174.
[47] Information supplied by G. G. Fuller, United States vice consul, Teheran, 1925.

PERU

Mineral production of Peru, 1920–1924 [1]

Mineral	1920	1921	1922	1923	1924
Antimony ore (exports)—tons	[2] 13				
Asphaltite—do	17,162	11,834	8,829	([3])	2,708
Bismuth, metallic (exports)[4]—kilograms	7,820		6,524	1,276	
Borax, crude—tons	261	405	555	253	519
Coal:					
Anthracite—do	9,308	8,322	7,490	[3] 253,000	3,585
Bituminous—do	351,767	337,159	287,002		148,150
Coke, metallurgical—do				45,000	20,000
Copper, metallic [5]—kilograms	32,981,665	33,283,506	36,407,978	44,166,000	33,937,956
Gold, fine—grams	1,951,738	2,407,035	2,532,899	3,744,000	3,700,000
Gypsum—tons					30,000
Lead, metallic [6]—do	562	518	709	686	843
Molybdenum concentrates (exports) [7]—kilograms	2,415	492		954	
Petroleum, crude—tons	373,280	488,669	700,619	751,710	1,045,547
Salt—do	27,172	26,350	26,126	26,522	27,030
Silver, fine—kilograms	274,393	311,308	409,635	580,229	582,180
Tungsten concentrates [8]—do	69,500	1,500			
Vanadium ore (exports) [9]—tons	9,700	[10] 1,776	[11] 22	[10] 3,187	[10] 6,643
Zinc ore, argentiferous (exports)—do	[12] 49				([13])

[1] Cuerpo de Ing. de Minas del Peru, Bol.; Movimiento economico de la industria minera del Peru; data furnished by the Dirección de Minas y Petroleo, Peru, through the United States consul, Callao.
[2] Average antimony content reported as 65 per cent.
[3] Small quantity of asphaltite included with coal.
[4] Bismuth content of bars, concentrates, etc., exported.
[5] Copper content of bars, matte, cement copper, concentrates, etc.
[6] Lead content of bars and concentrates.
[7] Average content of MoS_2 reported as follows: 1920, 85.05 per cent; 1921, 82 per cent; 1923, 85 per cent.
[8] Average content of WO_3 reported as follows: 1920, 66.3 per cent; 1921, 65 per cent.
[9] Average content of V_2O_5 reported as follows: 1920, 20.43 per cent; 1921, 20.39 per cent; 1922, 17 per cent; 1923, 19.82 per cent; 1924, 16.06 per cent.
[10] Includes small quantity of asphaltite ash.
[11] Asphaltite ash.
[12] Average zinc content reported as 45 per cent.
[13] Quantity of ore not available; zinc content reported as 144,697 kilograms.

PHILIPPINE ISLANDS

Mineral production of the Philippine Islands, 1920–1924 [1]

Mineral	1920	1921	1922	1923	1924
Asphalt and related bitumens—tons	2,000	766			
Cement—do				6,405	45,366
Coal—do	58,888	40,076	42,420	43,446	47,938
Gold, fine—grams	1,920,753	1,976,096	2,205,857	2,537,162	2,521,623
Gypsum—tons				402	2,840
Iron, pig—do	87	174	156	269	273
Lime—do	3,001	3,558	2,553	3,224	13,759
Phosphate rock—do			2,050	3,781	6,528
Platinum, crude—grams			42	420	
Salt [2]—tons	62,383	31,247	69,345	76,194	28,919
Sand, gravel, and crushed stone [2]—cubic meters	627,774	526,137	418,238	398,222	598,145
Silver, fine [3]—grams	307,343	814,621	836,047	1,174,976	1,680,419
Stone, building and ornamental [2]—cubic meters	49,373	48,972	57,097	50,550	16,894

[1] Mineral resources of the Philippine Islands, Div. Geol. and Mines, Bur. Science, Manila; data furnished by the Div. Geol. and Mines, Bur. Science, Manila.
[2] Estimate based on incomplete data.
[3] Silver is not mined separately, as it is found with the gold.

POLAND

Mineral production of Poland, 1920–1924 [1]

Mineral	1920	1921	1922	1923	1924
Briquets, fuel ..... tons	.....	.....	[2] 198,057	309,467	444,231
Cadmium ..... kilograms	.....	.....	[2] 24,777	40,991	18,703
Cement ..... tons	236,889	137,600	254,000	669,600	480,000
Coal:					
Bituminous ..... do	6,411,668	7,572,138	23,974,814	36,097,997	32,224,680
Lignite ..... do	248,477	270,415	219,983	171,035	88,038
Coke ..... do	([3])	([3])	678,972	1,376,194	949,758
Coke by-products:					
Ammonium sulphate ..... do	([3])	([3])	16,046	18,710	15,528
Benzol ..... do			13,476	15,604	13,805
Tar ..... do			58,645	52,025	44,218
Copper ore ..... do	10	.....	.....	.....	.....
Iron:					
Ore ..... do	120,000	240,489	352,531	450,175	289,281
Pig iron [4] ..... do	42,221	60,443	273,516	547,288	335,850
Lead:					
Ore ..... do	899	500	[2] 16,638	15,047	15,490
Metal [5] ..... do	1,500	1,010	8,375	16,256	16,276
Litharge ..... do	.....	.....	[2] 852	854	([3])
Natural gas ..... cubic meters	404,973,000	400,305,000	402,000,000	390,000,000	438,000,000
Ozokerite ..... tons	368	260	414	710	732
Petroleum, crude ..... do	765,024	704,874	713,103	737,181	770,792
Potash:					
Kainite ..... do	2,300	182	2,520	22,128	23,545
Sylvinite ..... do	7,993	15,329	43,563	39,375	57,875
Total K_2O ..... do	1,030	1,568	15,479	29,404	17,981
Pyrite, iron ..... do	2,649	3,964	[2] 6,452	5,708	6,869
Salt ..... do	245,604	301,612	295,403	363,307	[6] 646,448
Silver ..... kilograms	.....	.....	[2] 2,955	4,165	10,569
Steel, crude ..... tons	68,892	117,587	[2] 995,427	1,131,961	678,354
Zinc:					
Ore ..... do	64,354	58,824	[2] 294,281	300,522	308,199
Dust ..... do	.....	5	[2] 3,704	4,918	.....
Oxide ..... do	.....	.....	[2] 290	777	485
Metal [5] ..... do	5,361	5,000	51,401	95,678	96,708

[1] Annuaire statistique de la République Polonaise; Nouvelles statistiques, Office central de statistique, Poland; Zts. d. oberschl. berg- u. hüttenmänn. Vereins zu Katowice; data furnished by the Ministry of Commerce and Industries, Poland, through the United States consulate, Warsaw.

The data include the output of Polish Upper Silesia from the date of the transfer of the territory to Poland, except as otherwise noted.

[2] Includes the output of that part of Upper Silesia allocated to Poland from January to December, inclusive.

[3] Data not available.

[4] Includes ferro-alloys.

[5] Smelter output.

[6] Includes 371,182 tons of brine salt used in the manufacture of soda.

PORTUGAL

Mineral production of Portugal, 1920–1924 [1]

Mineral	1920	1921	1922	1923	1924
Antimony concentrates [2]—tons				17	36
Arsenic:					
Ore—do	62	11	106	160	279
White arsenic—do	653	268	604	887	874
Chromite, crude—do			[3] 300		
Coal:					
Anthracite—do	144,120	132,491	127,279	137,613	124,801
Lignite—do	25,045	3,241	14,380	15,952	8,121
Copper precipitate [4]—do	1,437	2,083	946	684	1,131
Ilmenite—do				31	53
Iron ore—do	12,845	10,370	18,292	9,145	8,573
Kaolin—do					181
Lead ore [5]—do	341	557	487	179	80
Manganese ore [6]—do	925	353	239		
Phosphate rock—do	1,775	1,054			
Pyrite, cupreous—do	247,972	239,771	198,846	203,555	618,561
Salt (exports) [7]—do	118,368	77,063	([8])	106,280	90,804
Silver—kilograms	38		6		
Tin:					
Concentrates [9]—tons	174	101	196	809	187
Metal—kilograms	7,104	985	4,367		6
Tungsten concentrates:					
Scheelite [10]—tons			3		
Wolfram [11]—do	218	282	571	304	[12] 282
Uranium ore [13]—do	437	1,032	945	355	367
Zinc ore [14]—do			1,200	22	

[1] Data furnished by the Bureau of Mines, Portugal, through the United States consul general, Lisbon, except as otherwise noted.
[2] Average antimony content reported as follows: 1923, 60 per cent; 1924, 50 per cent.
[3] Average content of Cr_2O_3 reported as 30 per cent.
[4] Copper content reported as follows: 1920, 51 to 70 per cent; 1921, 60 to 70 per cent; 1922, 62 to 74 per cent; 1923, 60 to 70 per cent; 1924, 65 to 70 per cent.
[5] Lead content reported as follows: 1920, 43 to 60 per cent; 1921, 40 to 70 per cent; 1922, 52 to 70 per cent; 1923, 46 to 70 per cent; 1924, 46 to 60 per cent.
[6] Manganese content reported as follows: 1920, 64 per cent; 1921, 38 per cent; 1922, 38 to 60 per cent.
[7] Figures as published by Imp. Min. Res. Bur., London, converted to metric equivalent.
[8] Data not available.
[9] Tin content reported as follows: 1920, 60 per cent; 1921, 40 to 65 per cent; 1922, 30 to 70 per cent; 1923, 50 to 70 per cent; 1924, 30 to 66 per cent.
[10] Average content of WO_3 reported as 70 per cent.
[11] Content of WO_3 reported as follows: 1920, 65 per cent; 1921, 60 to 69 per cent; 1922, 46 to 65 per cent; 1923, 50 to 65 per cent; 1924, 65 per cent.
[12] Includes a small quantity of tin-tungsten ore.
[13] Uranium content reported as follows: 1920, 0.5 to 1 per cent; 1921, 0.5 to 2 per cent; 1923 and 1924, 1 per cent.
[14] Average zinc content reported as 50 per cent.

PORTUGUESE EAST AFRICA (MOZAMBIQUE)

Knowledge of the mineral resources of Portuguese East Africa is rather meager, although the region has been known to Europeans for several hundred years. Deposits of asbestos, coal, copper, gold, petroleum, and tin have been reported, but the only minerals exploited are gold and silver at the ancient mines of the Macequece district, copper at one mine in the same district, coal at Tete, and tin at the two mines of Manica and Palbromur.

The most important of the mineral deposits are the large coal fields of Tete, which are now being developed by a British company. Samples of asbestos have been pronounced of excellent quality. In 1921 the output of the two tin mines mentioned was 5,565 kilograms; figures for later years are not available.[48] The production of gold and silver in 1920 to 1924 is reported in table following.

[48] Information supplied by S. U. Honaker, United States consul, Lourenço Marques, 1922, and C. M. P. Cross, United States consul at the same post, 1925.

Gold and silver produced in Portuguese East Africa, 1920–1924, in grams[1]

Metal	1920	1921	1922	1923	1924
Gold, fine	225,687	187,087	364,999	326,991	165,502
Silver, fine	21,772	15,614	15,987	(2)	(2)

[1] Publications, Imp. Min. Res. Bur., London. [2] Data not available.

PORTUGUESE INDIA

So far as known, the mineral industry of Portuguese India comprises mainly the production of salt and manganese. Deposits of gold and iron have been reported, but no data are available as to their commercial importance or present development.

There are 501 salt works in Gôa, with a total output of 12,000 tons of salt annually. Eleven salt works are in operation in Damão and five on the island of Diu.[49]

Manganese was discovered near Mormugão, Gôa, in 1906, and at the present time 20 mines are in existence.[49] Figures of production are not available.

PORTUGUESE WEST AFRICA

Angola.—Deposits of asphalt, coal, copper, diamonds, gold, iron, lead, manganese, mica, petroleum, and salt are reported in Angola, but only diamonds, gold, petroleum, and salt have been exploited to date.[50]

The gold deposits of the Mossamedes district have been worked for a number of years, but the output is unimportant. Mineral salt is produced in a crude way by the natives. Prospecting for oil has been under way several years, but no commercial output has been reported. The production of diamonds began in June, 1916, and has increased rapidly.[50] The output of these gems in 1920 to 1924 is reported as follows:[51] 1920, 93,529 carats; 1921, 106,719 carats; 1922, 98,683 carats; 1923, 94,478 carats; 1924, 118,016 carats.

Guinea.—Iron ore is crudely mined and smelted by the natives, but no other mineral industry is known.[52]

RHODESIA

Mineral production of Northern Rhodesia, 1920–1924 [a]

Mineral	1920	1921	1922	1923	1924
Bismuth ore, kilograms	1,216				
Copper, metal [b], do	131,541	199,580	181,436	131,541	99,790
Gold, fine, grams	17,698	43,016	77,914	49,486	38,724
Lead, metal [b], tons	14,836	17,969	20,830	11,197	5,999
Mica, kilograms	1,077				
Silver, fine, do	143	276	224	195	7,303
Vanadium ore, tons		56	143	47	28
Zinc ore, do		18	3	73	

[a] Rhodesia Chamber of Mines, Annual Report. [b] Smelter output.

[49] Statesman's Year Book, London, 1926.
[50] Information supplied by J. L. Pinkerton, United States vice consul, Loando, 1923.
[51] Imp. Min. Res. Bur., London.
[52] Handbook of West Africa, London, 1920.

Mineral production of Southern Rhodesia, 1920–1924 [1]

Mineral	1920	1921	1922	1923	1924
Abrasives: Corundum tons					38
Antimony ore do	10				
Arsenic ore do	396	327	451	774	533
Asbestos do	17,076	17,716	12,926	18,474	23,715
Barite do				9	64
Chromite, crude do	54,675	45,530	84,799	87,702	156,692
Coal do	524,796	521,404	467,787	559,999	591,526
Coke do	94,526	116,316	97,669	122,897	137,078
Copper, metal [2] kilograms	2,819,515	2,794,114	3,073,526	2,697,046	2,564,598
Gems: Diamonds carats	249	141	256	543	596
Gold, fine grams	17,184,611	18,211,866	20,304,072	20,139,224	19,524,557
Mica tons	88	77	60	83	136
Silver, fine kilograms	4,945	4,758	5,356	4,828	5,178
Tin concentrates tons	4	5	1		9
Tungsten concentrates do	15	15	41		20

[1] Rhodesia Chamber of Mines, Annual Report.
[2] Smelter output.

RUMANIA

Mineral production of Rumania, 1920–1924 [1]

Mineral	1920	1921	1922	1923	1924
Amber kilograms				67	230
Asphalt, crude tons	1,056	14,122	13,016	21,967	19,731
Bauxite do			3,737	4,162	
Bismuth, metallic kilograms				103	
Cement tons	(2)	150,000	170,000	202,900	(2)
Chromite, crude do			30	60	
Coal:					
Anthracite do	26,189	33,298	53,263	59,301	57,513
Bituminous do	161,337	176,670	201,379	232,682	239,775
Lignite do	1,400,049	1,594,719	1,861,579	2,229,410	2,479,083
Copper:					
Ore do	46	1,420	3,444	220	4,365
Metal [3] kilograms	164,795	107,569	110,523	70,813	89,635
Gold, fine grams	707,000	1,104,000	1,337,000	1,342,000	1,311,000
Gold-silver ores tons	108,425	147,518	173,122	184,802	199,713
Iron:					
Ore do	79,839	91,109	94,607	99,293	102,537
Pig iron do	19,007	33,362	31,419	39,102	46,081
Kaolin [4] cubic meters	(2)	2,250	2,590	3,801	4,258
Lead, antimonial:					
Ore tons		33	29	15	32
Metal [3] do	210	363	230	402	433
Manganese ore do	3,369	3,035	5,392	12,511	6,482
Mercury:					
Ore do				200	1,583
Metallic kilograms					254
Mica tons				6	
Natural gas 1,000 cubic meters	3,644,617	3,594,526	3,691,434	4,076,817	4,616,546
Petroleum, crude tons	1,108,924	1,168,414	1,372,905	1,512,302	1,860,471
Pyrite, iron do	10,889	15,937	20,381	25,512	32,657
Salt do	246,977	232,818	285,212	306,612	302,761
Silver, fine kilograms	2,135	2,872	1,954	2,341	2,246
Stone:					
Granite cubic meters	(2)	60,973	149,768	117,704	237,035
Limestone do	(2)	116,220	236,388	232,290	214,560
Marble do	98	477	816	1,061	862
Other stone do	(2)	131,363	198,784	259,345	205,172

[1] Direction générale des statistiques, Rumania: Statistique minière de la Roumanie; data furnished by the Dir. gén. d. stat., through the United States consulate, Bucharest.
[2] Data not available.
[3] Smelter product.
[4] Figures as published by the Imp. Min. Res. Bur., London.

RUSSIA

Mineral production of Russia, 1920–1924[1]

Mineral	1920	1921	1922	1923	1924
Abrasives:					
Corundum tons	63	7	2	(2)	
Emery do	676	592	(2)	(2)	(2)
Flint pebbles do	(2)	(2)	23	[3] 343	
Asbestite (?) do			[3] 1,507	[3] 1,197	[3] 3,5
Asbestos:					
Crude ore do	1,696	7,216	5,825	6,171	[3] 29,5
Fiber do	1,452	2,191	3,215	7,153	[3] 8,4
Barite do	328	(2)	(2)	(2)	(2)
Chromite, crude do	2,971	[4] 3,751	[3] 847	[3] 3,004	[3] 7,2
Clay:					
Fire clay do	(2)	(2)	14,712	(2)	(2)
Other clay do			28,870	[3] 15,437	
Coal:					
Anthracite do	7,611,900	8,914,600	9,058,300	14,504,300	[3] 16,188,9
Bituminous do					
Lignite do	(2)	(2)	5,902	(2)	(2)
Coke do	9,800	104,025	112,333	(2)	[3] 723,8
Copper (cement copper) do	55	183	(2)	(2)	(2)
Feldspar do	426	673	685	[3] 117	(2)
Gems: Garnets carats	(2)	(2)	640	(2)	(2)
Gold grams	1,785,526	1,389,641	5,118,127	[3] 7,293,023	[3] 11,002,6
Graphite tons	(2)	1,700	(2)	(2)	(2)
Iron:					
Ore do	164,087	170,356	220,775	493,376	[3] 930,9
Pig iron [3] do	103,688	122,853	166,828	155,000	664,6
Lead:					
Concentrates do	26	226	(2)	(2)	[3] 3
Metal (smelter product) do	193	265	394	555	[3] 62
Lime do	(2)	(2)	2,032	[3] 1,739	(2)
Magnesite, crude do	17,984	14,915	10,567	[3] 15,429	(2)
Manganese ore do	[5] 5,243	[6] 28,819	[3] 90,739	[3] 240,885	[3] 500,6
Mercury:					
Ore do	(2)	(2)	5,217	17,185	[3] 18,9
Metallic do		5	22	51	[3] 6
Mica do	(2)	(2)	8	(2)	(2)
Oil shale do	30,366	19,300	18,500	24,200	(2)
Peat do	1,546,711	2,320,670	2,105,640	2,037,778	(2)
Petroleum, crude do	3,869,000	4,179,000	4,946,400	5,517,400	6,317,20
Phosphate rock do	375	9,754	14,136	21,044	20,01
Platinum [7] grams	1,089,000	622,000	684,000	622,000	778,00
Pyrite:					
Cupreous tons	3,748	4,662	23,000	79,730	[3] 100,21
Iron do		6,348	5,352	22,300	[3] 24,97
Zinciferous do				242	[3] 2,66
Quartz do	(2)	(2)	4,369	[3] 3,156	(2)
Quartzite do	(2)	(2)	118,210	[3] 1,950	(2)
Salt do	579,162	983,676	789,516	966,456	[3] 1,192,80
Sand and gravel do	(2)	(2)	9,469	[3] 13,136	(2)
Silver [8] kilograms	1,555	1,244	4,665	6,000	7,77
Steel, crude tons	161,750	316,400	356,775	721,883	1,143,62
Stone:					
Building stone do	(2)	(2)	2,551	(2)	(2)
Dolomite do			514	[3] 3,066	
Limestone do			18,719	[3] 32,952	
Rubble do			1,276	[3] 1,343	
Tungsten ore: Wolfram kilograms	500				
Zinc:					
Concentrates tons	99	1,027	795	1,528	[3] 1,86
Metal (smelter product) do	77	231	118	19	[3] 51
Zinc-lead ore do	822	5,593	3,196	2,314	[3] 7,39

[1] Data taken as far as possible from the official statistics published in the Gornyi Zhurnal (Mining Journal) Moscow. Other sources consulted are: Mineral Resources of Russia, published by the Geologic Committee, Leningrad; First World Power Conference, Transactions; publications of the Imp. Min. Res. Bur., London; Glückauf and other foreign periodicals.

[2] Data not available.

[3] Data relate to year ended Sept. 30.

[4] Shipments from mines reported as 4,013 tons.

[5] Exclusive of Georgia and other parts of the Caucasus, for which data are not available.

[6] Exports.

[7] Estimates of production by J. M. Hill, of the U. S. Bureau of Mines. Other estimates differ widely No reliable statistics of output are available.

[8] Figures as published by the Director of U. S. Mint.

SALVADOR [53]

Mines of copper, iron, lead, and silver-lead have been worked at various times, but in recent years the production of gold and silver has constituted the only mineral industry of Salvador. The only figures of production available relate to the year 1920, when the output of gold and silver (fine) was 190,000 grams and 8,151,000 grams, respectively.

SIAM

Mineral production of Siam, 1920–1924 [1]

[Exports]

Mineral	1920	1921	1922	1923	1924
Antimony ore—tons					9
Coal (lignite)—tons	(2)	(2)	(2)	(2)	(2)
Gold leaf—pieces	5,000				
Lead ore—tons				8	
Salt—do	50,737	[3] 29,824	[3] 26,542	[3] 32,948	[3] 40,564
Tin:					
Concentrates [4]—do	[5] 8,609	8,448	6,695	10,041	10,619
Metal [6]—do	6,301	367	508	596	437
Tungsten concentrates: Wolfram—do	117	65		(7)	

[1] Data from the Siamese customs report, furnished by the United States consulate, Bangkok, except as otherwise noted. Period covered represents the year ended Mar. 31 of the year following that stated.
[2] Lignite is mined in Siam but not exported. Consecutive statistics of output are not available, but the production in the beginning of 1924 is reported to have been about 1,000 tons a month. (C. H. Albrecht, United States consul, Bangkok.)
[3] Figures as published by the Imp. Min. Res. Bur., London.
[4] The tin content of concentrates exported is arbitrarily taken as 70 per cent. The actual content probably averages 71 to 72 per cent. (J. P. Davis, United States consul, Bangkok, 1921.)
[5] Exports from port of Bangkok, through which port about 85 per cent of the trade of Siam passes (Imp. Min. Res. Bur., London.)
[6] Figures for 1920 represent tin content of concentrates exported; those for other years, smelter product.
[7] Only 11 kilograms reported exported.

SOMALILAND

British Somaliland.[54]—No mineral industry is known to exist in British Somaliland except the extraction of salt from sea water by evaporation. Deposits of copper, gypsum, limestone, mica, and petroleum have been reported, but none of these minerals have been exploited commercially, so far as known. The petroleum deposits are believed to be important; investigations now in progress are encouraging. The annual output of salt is estimated to be about 15,000 tons; virtually all of it is consumed locally.

French Somaliland.[54]—The only mineral industry known in French Somaliland is the salt works of Djibouti, where salt is recovered from sea water by evaporation; the annual production is estimated at about 15,000 tons, most of which is consumed locally. So far as known, no other mineral deposits have been reported.

Italian Somaliland.—No mineral deposit of any kind has yet been reported in Italian Somaliland.

[53] Data supplied by the Dirección General de Estadística de El Salvador.
[54] Information supplied by C. M. P. Cross, United States consul, Aden, 1922.

SOUTHWEST AFRICAN PROTECTORATE

Mineral production of the Southwest African Protectorate, 1920–1924 [1]

Mineral [2]	1920	1921	1922	1923	1924
Copper-lead-zinc ores, tons	36,890	73,809	115,161	116,840	124,794
Gems: Diamonds, carats	606,424	171,321	144,156	433,229	492,696
Gold, fine, grams	----------	----------	----------	----------	4,572
Iron ore, tons	[3]	[3]	[3]	[3]	5,835
Lead [4], do	----------	450	658	622	813
Salt, rock, do	[3]	[3]	[3]	[3]	340
Tin concentrates [5], do	204	159	227	241	220
Vanadium concentrates, do	366	660	2,013	1,475	2,156

[1] Publications, Imp. Min. Res. Bur., London; data supplied by C. M. P. Cross, United States consul, Cape Town, South Africa.
[2] In addition to the minerals listed, deposits of the following have been located, but have not yet been exploited: Apatite, asbestos, coal, cobalt-nickel ores, corundum, semiprecious gem stones (beryl, rose quartz, topaz, tourmaline), limestone, marble, mica, molybdenite, monazite, tantalite, tungsten ore (scheelite and wolframite), and uranium.
[3] Data not available.
[4] Smelter output for years ended Mar. 31 of year following that stated.
[5] Average tin content reported as 70 per cent.

SPAIN

Mineral production of Spain, 1920–1924 [1]

Mineral	1920	1921	1922	1923	1924
Abrasives:					
Garnet, tons	198	5	[2]	982	1,112
Tripoli, do	597	494	524	869	404
Alum, do	770	----------	160	210	----------
Aluminous earths (smectic clay), do	219	363	192	372	300
Amblygonite, do	20	----------	----------	----------	----------
Antimony ore, do	----------	----------	----------	88	----------
Arsenic, white, do	76	----------	----------	----------	----------
Asbestos, do	----------	19	5	----------	----------
Asphalt, crude, do	4,222	3,533	5,933	3,936	5,476
Barite [3], do	13,773	9,650	7,705	18,434	14,450
Bauxite, do	540	184	----------	----------	----------
Bismuth:					
Ore, do	53	52	49	91	125
Metal, kilograms	25,000	22,000	9,500	22,000	41,148
Briquets, fuel, tons	742,408	732,992	675,884	663,667	627,014
Carbonaceous shale [4], do	----------	9,213	----------	12,228	----------
Cement:					
Natural, do	161,551	213,885	219,011	358,627	235,379
Portland, do	318,635	326,453	510,024	504,727	681,689
Clay:					
Fire clay, do	30	10,525	30	4,600	1,170
Kaolin, do	950	1,535	12,574	[5] 4,730	2,532
Other clay, cubic meters	53,982	75,230	224,572	275,653	323,870
Coal:					
Anthracite, tons	491,715	292,591	256,310	299,069	316,190
Bituminous, do	4,928,989	4,719,638	4,179,533	5,672,377	5,811,396
Lignite, do	552,425	408,684	329,680	394,268	411,773
Coke:					
Gas house, do	[2]	[2]	71,728	91,625	132,995
Metallurgical, do	280,717	446,087	311,423	651,966	724,082
Coke by-products:					
Ammonium sulphate [6], do	2,207	23,956	3,562	5,607	10,793
Benzol [6], do	1,202	1,986	1,836	2,839	7,172
Tar [6], do	7,306	19,613	13,105	16,171	35,568
Copper:					
Ore [7], do	218,969	157,310	183,618	255,866	283,866
Blister, kilograms	9,790,000	20,195,000	8,015,000	10,126,000	13,297,000
Cement, do	11,168,000	14,350,446	15,524,000	32,080,000	19,749,000
Electrolytic, do	----------	1,800,000	2,000,000	3,060,000	3,300,000
Ingots and wire, do	1,500,000	----------	----------	----------	----------

[1] Consejo de Minería, Spain: Estadística Minera de España, except as otherwise noted.
[2] Data not available.
[3] Includes following quantities reported produced from quarries: 1921, 8,740 tons; 1922, 5,630 tons; 1923, 6,670 tons; 1924, 7,682 tons. This quarry product is reported in cubic meters, which have been converted to tons at the rate of 4.6 tons to the cubic meter.
[4] Used in the manufacture of cement.
[5] Exclusive of 13,172 tons of kaolinic sand.
[6] Incomplete data.
[7] See also cupreous iron pyrites.

Mineral production of Spain, 1920–1924—Continued

Mineral	1920	1921	1922	1923	1924
Fluorspar—tons	416	176	392		4,474
Glauberite—do	1,106				
Gold, fine [8]—kilograms			22	28	30
Gold ore—tons	10	292	1,937	620	260
Graphite—do	6,315	2,772	530		
Gypsum:					
Alabaster—cubic meters	96	125	97	102	97
Other—do	54,077	113,570	222,395	288,253	304,538
Iron:					
Ore—tons	4,767,693	2,602,369	2,771,888	3,456,233	4,612,817
Pig iron [9]—do	251,412	347,497	210,099	408,659	510,279
Lead:					
Ore—do	186,289	167,892	167,654	182,135	198,953
Metal—do	175,196	135,881	119,387	127,514	141,849
Magnesium carbonate, crude—do	1,214		303		
Manganese ore—do	21,256	20,098	25,455	[10] 28,635	20,840
Manganiferous iron ore—do	2,100				11,975
Mercury:					
Ore—do	17,480	16,146	14,374	16,852	15,192
Metal—kilograms	861,689	635,440	1,318,160	1,144,557	898,699
Mica—tons	5	2		3	
Mineral oil:					
Distilled from coal [6]—do	770	2,063	4,320	3,960	6,527
Distilled from shale [6]—do					
Mineral paints:					
Ocher, crude—do	301	115	200	418	353
Red lead—do	1,025	674	593	567	511
White lead—do	2,859	2,779	2,625	1,847	1,535
Other pigments—do	8,786	5,951	8,300	15,147	26,102
Molybdenum ore: Wulfenite—do	56				
Nitriferous earth [11]—do				3,000	1,000
Peat—do			300		
Phosphate rock—do	42,896	38,064	6,492	5,397	6,746
Pyrite:					
Arsenical—do	1,000				
Cupreous-iron—do	643,224	1,981,641	1,871,509	2,163,554	1,615,233
Iron—do	711,823	623,986	468,080	488,987	597,132
Quartzite—cubic meters	[7]	12,000	11,945	8,115	5,600
Salt:					
Rock—tons	62,647	37,996	114,400	98,619	105,450
Other—do	928,898	475,143	566,480	617,207	862,856
Sand:					
Glass sand—cubic meters	[7]	[7]	[7]	[7]	3,100
Other—do					1,007
Silica (quartz)—do	80	110	78	23,530	5,837
Silver, fine—kilograms	91,961	83,339	86,415	88,400	89,579
Silver ore—tons	214	284	27	240	405
Slate—cubic meters	29,348	39,110	15,428	13,464	13,636
Sodium sulphate, natural—tons	299	120	6,694	10	10
Steel, crude—do	[7]	359,897	230,867	462,601	540,012
Stone:					
Basalt—cubic meters	3,900	3,950	3,800	3,000	1,333
Dolomite—do	[7]	[7]	1,400	6,600	8,461
Granite—do	70,000	47,418	60,519	64,013	47,455
Limestone—do	402,824	503,097	713,680	1,537,811	1,233,912
Marl for cement—do	52,960	30,980			
Marble—do	2,318	3,859	3,482	5,272	10,482
Sandstone—do	57,121	22,178	56,900	67,002	34,447
Other stone—do	28,126	5,387	26,614	33,689	24,475
Sulphur:					
Ore—tons	77,039	85,678	72,806	66,371	64,650
Refined—					
Flowers—do				5,984	[12] 4,287
Ground—do	12,693	13,551	22,829	3,710	[12] 299
Lump—do				7,825	[12] 4,862
Other—do				193	[12] 92
Talc and soapstone—do	2,146	1,115	3,078	1,983	1,977
Tin ore, crude—do	144	13	145	53	94
Tungsten ore: Wolfram—do	62	25		28	200
Zinc:					
Ore—do	94,051	48,357	71,996	102,313	116,721
Metal—do	9,647	6,738	6,269	10,922	12,777

[7] Data not available.
[6] Incomplete data.
[8] Figures as published by the Director of the Mint, United States.
[9] Includes ferro-alloys, when reported.
[10] Includes 20 tons of ore averaging only 20 per cent of manganese.
[11] Average content of potassium nitrate reported as follows: 1923, 2.5 per cent; 1924, 2.87 per cent.
[12] Exclusive of that made from imported material, which was reported as follows: Flowers, 1,472 tons; ground, 4,419 tons; lump, 3,085 tons; other, 39 tons.

SPITSBERGEN (SVALBARD)

Mineral production of Spitsbergen, 1920–1924, in tons[1]

Mineral and island	1920	1921	1922	1923	1924
Spitsbergen proper:					
Coal [2]	[3] 130,000	[3] 210,000	307,000	327,942	431,087
Zinc ore					27,963
Bear Island: Coal [2]	([3])	([3])	9,000	13,000	20,827

[1] Data for 1920 and 1921, R. N. R. Brown, Scottish Geog. Mag., vol. 38, pp. 115–117; those for following years furnished by Dr. Adolf Hoel, lecturer on geology, Univ. of Oslo, through the United States consulate, Oslo.
[2] Figures represent bunker coal and coal exported and do not include coal consumed at mines, for which no statistics are available.
[3] Output of Bear Island included with Spitsbergen proper.

SURINAM (DUTCH GUIANA) [55]

Deposits of iron ore have been located in Surinam, but have not been exploited. Unimportant deposits of quicksilver on the Maroni River have been worked in a small way, but data of output are not available. The chief mineral products of the colony are gold and bauxite, the output of which for the period under review is as follows:

Mineral production of Surinam, 1920–1924

Mineral	1920	1921	1922	1923	1924
Bauxite—tons			18,805	15,839	63,097
Gold, crude—grams	470,764	351,182	373,646	396,224	322,671

SWAZILAND

The only minerals reported produced in Swaziland are gold and tin. Large deposits of coal [56] of good quality are known but have not been commercially developed.

The production of gold and tin for the years under review is reported as follows: [57]

Mineral production of Swaziland, 1920–1924

Mineral	1920	1921	1922	1923	1924
Gold, fine—grams	3,950	6,781	13,281	2,893	11,695
Tin, metal [a]—tons	282	144	109	174	281

[a] Tin content of concentrates.

[55] Information furnished by the Governor of Surinam, Paramaribo.
[56] G. K. Donald, United States consul, Johannesburg, 1923.
[57] Publications, Imp. Min. Res. Bur., London.

SWEDEN

Mineral production of Sweden, 1920–1924[1]

Mineral	1920	1921	1922	1923	1924
Abrasives:					
Diatomaceous earth tons	621	600	322	696	608
Grindstones [2]	($21,437)	($6,131)	($5,473)	($7,405)	($7,956)
Millstones tons	240	46	123	170	120
Aluminum [3] kilograms	25,484	9,595	23,160	208	2,046
Antimony [3] do		4,888	7,467	6,207	7,213
Arsenic ore tons					[4] 80
Cement do	280,876	242,331	366,231	392,602	406,665
Cerite and allanite do		11	78	825	
Chalk, washed do	10,455	6,508	9,382	8,459	12,196
Clay:					
Fire clay do	116,827	113,059	99,200	115,820	149,072
Kaolin do	4,743				
Other (clinker clay) do	40,924	21,790	1,872	29,173	37,319
Coal do	439,584	376,692	378,861	419,569	437,856
Coke:					
Gas house [5] do	155,194	147,045	180,511	176,553	185,952
Metallurgical do	47,091	8,462	27,195	114,200	79,328
Copper:					
Ore do	1,136	441	433	2,446	174
Blister kilograms	25,094				598,053
Cement copper do	1,800,352	2,941,251	1,248,280	6,070,876	5,805,418
Refined copper [6] do	1,627,045	1,329,238	60,979	118,617	2,142,701
Feldspar:					
Ground tons	339	192	908	849	434
Unground do	12,049	19,977	21,463	16,008	18,875
Gold [7] grams	7,610	1,646	988	8	
Graphite tons	7				
Gypsum kilograms		157,800	174,900	193,800	223,200
Iron:					
Ore tons	4,519,112	6,464,347	6,201,243	5,588,173	6,499,730
Pig iron [8] do	484,174	320,037	275,441	301,619	535,361
Sponge iron do	4,263			2,193	589
Lead:					
Work lead do	1,325	504	340	154	592
Antimonial lead do	60				
Refined lead [9] do	839	559	379	307	671
Lime hectoliters	4,103,005	3,118,452		3,944,895	4,003,144
Litharge kilograms	15,035	25,715	8,514		
Manganese ore:					
Crude tons	14,926	6,245	4,510	5,045	10,881
Powdered do	34	8	18	158	4
Mica do			8	5	4
Mineral oil, from alum shale kilograms	285,000	327,840	353,000	157,500	
Molybdenum ore do	600				
Peat:					
Briquets tons	250				
For fuel do	384,792	178,264	109,111	125,257	83,884
Litter, baled do	156,389	114,525	116,657	134,269	110,694
Litter and "mull," unbaled cubic meters	110,001	46,824	59,041	38,373	32,103
"Peat mull," baled tons	22,649	16,763	20,920	23,859	17,268
Powder do	1,620	2,967	8,410	6,818	7,701
Platinum [3] kilograms				6	
Pyrite, iron tons	107,326	45,772	57,321	58,297	66,353
Quartz:					
Ground do	1,181	877	1,767	1,729	2,320
Unground do	30,162	15,603	16,412	25,428	51,721
Silver [7] kilograms	360	415	1	18	
Silver-lead ore tons	2,901	578	1,689	2,842	2,777
Slate:					
Ground do	252	366		560	1,350
Roofing do	565	375	465	800	1,100
Other [3]	($4,970)	($4,100)	($2,341)	($7,727)	($4,962)

[1] Kommerskollegium, Sweden: Bergshantering; Industri.

[2] Quantity not reported. The value as given in kronor converted to United States currency at the annual average rate of exchange, according to which the value of 1 krona was as follows: 1920, $0.2049; 1921, $0.2254; 1922, $0.2617; 1923, $0.2655; 1924, $0.2652.

[3] From scrap.

[4] Ore reported to contain 24 per cent arsenic, 1.85 per cent copper, 103 grams of gold, and 220 grams of silver per ton.

[5] Of the gas-house coke reported, the following quantities were made from peat: 1920, 644 kilograms; 1921, 736 kilograms; 1922, 137,250 kilograms. None was made from peat in 1923 and 1924.

[6] Includes the following quantities made from scrap: 1920, 338,171 kilograms; 1921, 180,379 kilograms; 1922, 60,979 kilograms; 1923, 118,617 kilograms; 1924, 138,075 kilograms.

[7] Exclusive of that extracted from scrap.

[8] Includes ferro-alloys.

[9] Includes the following quantities made from scrap: 1920, 37 tons; 1921, 71 tons; 1922, 73 tons; 1923, 188 tons; 1924, 194 tons.

Mineral production of Sweden, 1920–1924—Continued

Mineral	1920	1921	1922	1923	1924
Sodium, metallic ..... kilograms	165,096	271,001			
Steel, crude ..... tons	437,474	211,602	311,033	270,680	500,942
Stone:					
Granite and gneiss—					
Blocks, rough ..... do	6,175	20,193	13,651	19,890	22,222
Building stone, rough ..... do	13,499	19,901	15,809	17,777	11,952
Dressed stone ..... do	834	601	807	848	1,121
Paving and flagstones ..... do	332,038	317,031	344,668	448,635	668,541
Other [10] ..... do	238,539	201,182	215,719	263,128	301,505
Granite, so-called black or green—					
Blocks ..... do	13,384	5,519	7,326	11,460	19,890
Dressed ..... do	6,906	2,182	2,144	2,291	2,437
Limestone and dolomite—					
Building and monument stone, dressed ..... tons	9,591	6,273	6,376	9,108	11,125
Ground limestone ..... do	99,520	65,098	57,799	86,000	40,533
Rough stone ..... do	439,812	249,471	330,034	497,077	512,758
Other [10] ..... do	6,683	234	5,053	4,090	27,444
Marble—					
Blocks, rough ..... do		44	42	47	61
Building and monument stone ..... tons	1,352	515	486	628	1,095
Other [2]	($196,189)	($229,724)	($247,669)	($306,222)	($251,473)
Porphyry, for monuments ..... tons		6	18	3	
Sandstone, quartzite, and flint—					
Building stone ..... do		46	10	15	185
Other [10] ..... do	10,093	34,380	53,601	81,114	93,809
Talc and soapstone:					
For buildings and monuments ..do	600	600	601	905	1,018
Powdered ..... do	1,583	1,197	1,462	1,525	1,855
Other (utensils, flagstones, etc.) [3]	($73,354)	($62,661)	($66,210)	($84,960)	($92,555)
Tin:					
Metal [3] ..... kilograms	11,773	5,481			
Precipitate ..... do					[11] 9,708
Tungsten ores: Wolfram ..... do	30,536				
Zinc:					
Ore ..... tons	47,674	29,426	38,023	41,912	47,691
Crude zinc ..... do	1,606	1,789	2,157	187	825
Refined and commercial zinc [12] ..do	5,850	3,547	1,594	1,289	3,521

[2] Quantity not reported. The value as given in kronor converted to United States currency at the annual average rate of exchange, according to which the value of 1 krona was as follows: 1920, $0.2049; 1921, $0.2254; 1922, $0.2617; 1923, $0.2655; 1924, $0.2652.

[3] From scrap.

[10] Exclusive of small quantities, for which value only is reported.

[11] Tin content reported as 73.61 per cent.

[12] Includes the following quantities made from scrap: 1920, 90 tons; 1921, 37 tons; 1922, 44 tons; 1923, 75 tons; 1924, 70 tons.

SWITZERLAND

The mineral resources of Switzerland are not important enough to warrant exploitation on a large scale, and mining is largely in the hands of small local enterprises. No official statistics of mineral production have been published in recent years.

Deposits of asbestos, asphalt, barite, clay, coal, cobalt, fluorspar, graphite, gypsum, iron, lead, mica, nickel, oil shale, peat, pyrite, salt, slate, soapstone, building stones of various kinds, talc, and zinc are known. Some of these minerals have been worked on a small scale for many years, chief among them being asbestos, asphalt, coal, gypsum, iron, peat, salt, slate, and building stone.[58] Under the stress of the coal shortage during the World War and the years immediately after, the peat bogs of Switzerland were worked extensively, the output in 1919 rising to 300,000 tons; but the output for 1920 was much less.[59]

[58] Fehlmann, H., Der schweizerische Bergbau während des Weltkrieges. Bern, 1919.

[59] Information supplied by L. W. Haskell, United States consul, Geneva, 1922.

The production of the minerals for which data are available is given in the following table:

Mineral production of Switzerland, 1920–1924, in tons [1]

Mineral	1920	1921	1922	1923	1924
Asphalt [2]	14,047	17,478	22,039	19,904	33,150
Coal	[3] 74,590	11,000	4,000	(4)	(4)
Iron ore	(4)	[5] 28,043	[2] 58,823	[5] 76,000	[2] 81,375
Salt	[6] 128,058	[6] 107,610	64,268	68,026	(4)

[1] Publications, Imp. Min. Res. Bur., London, except as otherwise noted.
[2] Exports.
[3] Information supplied by L. W. Haskell, United States consul, Geneva, 1922.
[4] Data not available.
[5] Output of the Gonzen Aktien-Gesellschaft. Manganese ore included.
[6] Bull. mensuel, Inst. Internat. de Statistique, The Hague, gives the production of salt in Switzerland in 1920 and 1921 as follows: 1920, 448,000 tons; 1921, 339,000 tons. Figures for later years are not given.

SYRIA

Coal and lignite are found throughout Syria but are nowhere of high quality. Petroleum indications are numerous, but attempts at exploitation have proved unprofitable. Asphalt and bituminous limestone have been considered the most important mineral resource of the country and as yet have been the only one profitably exploited.

Other minerals reported are chromite, copper, gold, gypsum, iron, lead, marble and other building stones, nickel, ocher, pandermite, phosphate rock, pyrite, salt, silver, and tin.[60] No data of production are available.

TANGANYIKA TERRITORY

Mineral production of Tanganyika Territory, 1920–1924 [1]

Mineral [2]	1920	1921	1922	1923	1924
Gold, fine—grams	(3)	9,984	11,695	60,776	242,483
Mica—tons	[4] 27	[4] 3	[4] 11	[4] 33	57
Mineral paint ores: Ocher—do					7
Salt—do	(3)	(3)	2,427	1,918	4,629

[1] Publications of the Imp. Min. Res. Bur., London; data supplied by the Controller of Mines, Tanganyika Territory, through the United States consulate, Nairobi, Kenya Colony.
[2] In addition to the minerals listed, asbestos, bitumen, coal, copper, diamonds, iron ore, manganese, nickel, marble, and uranium are reported. (Francke, P., "Die bergbauliche Entwicklung des Tanganjika Territoriums": Glückauf, Jahrg. 60, 1924, pp. 1086–1089.) Deposits of tin are also known, but were not commercially exploited during 1920–1924.
[3] Data not available.
[4] Exports.

TRINIDAD

Mineral production of Trinidad, 1920–1924 [a]

Mineral	1920	1921	1922	1923	1924
Asphalt—tons	143,365	121,651	185,587	224,900	227,460
Manjak—do	136				
Petroleum, crude—hectoliters	3,312,555	3,743,726	3,887,791	4,851,680	6,451,068
Stone: Limestone and road material [b]—tons	194,561	230,891	266,250	225,576	201,268

[a] Administration report, Inspector of Mines, Trinidad.
[b] Includes gravel.

[60] Toll, I. M., "The mineral resources of Syria": Eng. and Min. Jour., vol. 112, No. 22, 1921, p. 846. Information also supplied by P. Knabenshue, United States consul, Beirut, 1925.

TUNISIA

Mineral production of Tunisia, 1920–1924, in tons [1]

Mineral	1920	1921	1922	1923	1924
Cement	261	250	(2)	2,100	(2)
Clay	14,308	14,600	40,990	67,000	57,65(
Coal (lignite)	31,331	22,207	343	620	30!
Copper ore [3]			48	187	16:
Gypsum	8,120	8,000	8,820	6,000	20,00(
Iron ore	406,280	265,736	496,762	845,000	797,68(
Lead:					
Ore [4]	24,769	18,500	28,582	36,000	40,00(
Metal (work lead)	11,407	12,225	14,552	14,090	14,291
Lime:					
Hydraulic	30,400	30,000	(2)	32,400	39,400
Quicklime	14,745	15,000	(2)	16,500	15,300
Manganese ore [5]	1,300	1,500	180	1,153	3,220
Phosphate rock	1,075,180	1,800,000	2,117,650	2,338,000	2,391,000
Salt	41,086	32,800	51,950	72,982	123,606
Sand and gravel	46,107	57,000	67,600	55,750	85,500
Stone:					
Building stone, dressed	18,000	11,000	(2)	(2)	(2)
Limestone for lime and other industrial uses	(2)	(2)	41,580	(2)	73,750
Other stone	496,300	1,148,600	445,000	524,000	(2)
Zinc ore [6]	12,575	4,541	8,868	12,000	14,811

[1] Statistique de l'industrie minérale en France et en Algérie; data furnished by Service des Mines, Tunisia.
[2] Data not available.
[3] Average copper content reported as follows: 1922, 40 per cent; 1923, 25 per cent; 1924, 8 to 10 per cent.
[4] Average lead content reported as follows: 1920–21, 60 per cent; 1922–23, 55 to 60 per cent; 1924, 50 per cent.
[5] Average manganese content reported as follows: 1920, 43 per cent; 1921, 45 per cent; 1922, 43 per cent; 1923, 42 per cent; 1924, 30 to 40 per cent.
[6] Average zinc content reported as follows: 1920–21, 40 per cent; 1922, 35 to 40 per cent; 1923, 40 per cent; 1924, 35 per cent.

TURKEY

No mineral survey of Turkey has ever been made, and knowledge of the mineral resources of the country is therefore meager. Annual statistics of production are not collected. The mineral resources of Asiatic Turkey are generally believed to be great, and those of Turkey in Europe inconsiderable. Some deposits of lignite and petroleum are reported in European Turkey, but no mining worthy of note has been done.

Deposits of the following minerals [61] are known in Asia Minor and many of them have been worked for centuries: Alum, antimony, arsenic, borax, chromite, clay, coal, cobalt, copper, emery, fuller's earth, gold, gypsum, iron, lead and silver-lead, manganese, meerschaum, mercury, pandermite (calcium borate), petroleum, phosphate rock, platinum, salt, silver, sulphur, and zinc.

Coal and lignite are widely distributed throughout Asia Minor, but the center of the coal-mining industry is in the Heraclea Basin, where great beds of bituminous coal have been mined for many years.

Copper occurs in numerous localities, but the deposits of Argana Maden, which are reputed to be enormous and remarkably rich, have been the center of interest and overshadow all others. The workings date back to antiquity, but the mines are still regarded as the most valuable in the country.

The emery mines of Smyrna are very productive and rank next in importance to those of Naxos as the source of the world's supply of this abrasive. The pre-war output averaged 33,000 tons annually.

[61] Ravndal, G. B., Turkey, A Commercial and Industrial Handbook: U. S. Bur. For. and Dom Com. Trade Promotion Ser. 28, 1926, pp. 126–159.

Asia Minor formerly produced 60 per cent of the world's chromite, and as late as 1922 still held fourth place among producers, with an output of 25,000 tons.

The average annual production of salt, both rock and brine, is estimated at 100,000 tons.[62]

The production of gold averages about 45 kilograms a year.

UNION OF SOUTH AFRICA

Mineral production of the Union of South Africa, 1920–1924 [a]

Mineral	1920	1921	1922	1923	1924
Abrasives:					
Corundum ---tons	237	112	1,836	2,554	1,695
Diatomaceous earth ---do	----------	----------	[b] ($9,277)	217	236
Arsenic, white ---do	10	2	3	5	96
Asbestos ---do	6,452	4,647	3,982	7,614	6,569
Cement [c] ---do	[d]	[d]	[d]	307,062	280,295
Chromite, crude [e] ---do	----------	1,078	87	----------	4,572
Coal [f] ---do	10,922,380	10,815,571	9,271,948	11,252,305	11,819,988
Coke, metallurgical [g] ---do	19,674	24,224	38,405	53,926	67,561
Copper, fine [g] ---kilograms	1,075,008	91,625	664,963	7,978,648	8,383,250
Flint ---tons	[b] ($4,507)	[b] ($1,147)	[b] ($2,057)	7	----------
Fluorspar ---do	[b] ($14,656)	[b] ($693)	[b] ($3,435)	10,975	10,192
Gems: Diamonds [g] ---carats	2,612,511	828,036	669,559	2,053,095	2,440,398
Gold, fine [g] ---grams	253,756,350	252,831,177	218,030,985	284,568,018	297,817,075
Graphite ---tons	66	43	38	54	50
Gypsum ---do	[b] ($51,655)	[b] ($33,413)	[b] ($21,342)	5,823	9,219
Iron:					
Ore ---do	2,326	2,192	1,913	521	----------
Pig iron [h] ---do	1,368	1,041	----------	----------	----------
Jade [b]	----------	----------	----------	----------	($1,395)
Kaolin ---tons	----------	----------	18	30	----------
Lead:					
Ore and concentrates [i] ---do	538	206	[d]	[d]	[d]
Metal [i] ---do	----------	----------	4,261	5,099	4,609
Magnesite ---do	1,287	1,317	962	1,240	1,825
Manganese ore [j] ---do	61	287	157	592	930
Mica ---kilograms	695	1,146	3,301	14,219	734,659
Mineral paint ores ---tons	486	106	266	217	288
Osmiridium, fine [k] ---grams	----------	15,863	23,701	96,452	179,280
Pyrite, iron ---tons	3,147	3,949	2,848	2,966	2,349
Salt [l] ---do	80,603	62,033	75,806	62,170	70,369
Silver, fine [m] ---kilograms	27,763	25,826	34,701	42,734	43,450
Slate [b]	($16,184)	($24,018)	($21,687)	($25,905)	($24,093)
Soda ---tons	----------	283	115	87	844
Stone, for buildings, curbing, etc.: [b]					
Granite	($120,000)	($182,358)	($108,284)	($187,085)	($379,914)
Limestone	----------	----------	($3,715)	($6,297)	($3,309)
Marble	----------	----------	($9)	----------	----------
Sandstone	($37,351)	($37,874)	($57,711)	($96,497)	($182,602)
Verdite	($1,587)	----------	($123)	----------	----------
Talc and soapstone ---tons	619	375	309	322	575
Tin concentrates [n] ---do	2,095	1,132	697	1,393	1,786
Vanadium ore [o] ---do	----------	----------	----------	65	----------
Zinc ore [p] ---do	2,131	1,161	----------	----------	----------

[a] Ann. Rept. of the Sec. for Mines and Ind. and of Govt. Mng. Eng., Dept. Mines., Un So. Africa, except as otherwise noted. Data relate to sales and shipments, except as otherwise noted.

[b] Value only reported. Values converted from pounds sterling at the annual average rates of exchange for the Union of South Africa, as compiled in the financial and investment division, U. S. Bureau of Foreign and Domestic Commerce.

[c] Production. Data furnished by C. H. Hall, jr., United States vice consul, Johannesburg.

[d] Data not available.

[e] Production. Average content of Cr_2O_3 reported as follows: 1921, 43.62 per cent; 1922, 35 per cent; 1924, 43.06 per cent.

[f] Production of marketable coal.

[g] Production.

[h] Produced from ore.

[i] Estimated content of ore produced.

[j] Production. Average manganese content reported as follows: 1920, 54.55 per cent; 1921, 51.49 per cent; 1922, 55 70 per cent; 1923, 67.78 per cent; 1924, 70.54 per cent.

[k] Recovered by gold mines on the Witwatersrand and in Heidelberg. Figures for 1921 and 1922 represent sales; those for 1923 and 1924, production.

[l] Production. Figures for 1920, those published by the Imp. Min. Res. Bur., London; those for other years furnished by C. H. Hall, jr., United States vice consul, Johannesburg.

[m] Mostly contained in gold bullion.

[n] Production. Average tin content reported as follows: 1920, 69.34 per cent; 1921, 69.53 per cent; 1922, 70.63 per cent; 1923, 66.94 per cent; 1924, 66.06 per cent.

[o] Production. Average vanadium content reported as 7.45 per cent.

[p] Average zinc content reported as follows: 1920, 52.64 per cent; 1921, 50.86 per cent.

[62] Publications, Imp. Min. Res. Bur., London.

Mineral production of the Union of South Africa, 1920–1924, by Provinces

Province and mineral	1920	1921	1922	1923	1924
CAPE OF GOOD HOPE					
Abrasives: Corundum—tons	14		(1)	11	
Asbestos—do	3,199	3,146	2,714	3,916	2,7
Coal—do	5,233	5,294	6,542	5,550	5,2
Copper, fine—kilograms	257,639	90,718	664,963	2,648,966	2,824,9
Gems: Diamonds—carats	1,400,899	244,794	137,471	1,134,287	1,290,1
Gold, fine—grams	591	62	186	311	
Gypsum [2]	($4,522)	($585)	($2,311)	($25,553)	($44,747
Iron ore—tons	88				
Lead ore and concentrates [3]—do				94	2
Stone:					
Granite [2]	($43,301)	($85,263)	($31,805)	($31,050)	($44,894
Sandstone [2]	($8,460)	($2,902)	($3,352)	($16,216)	($10,212
Tin concentrates [4]—tons	7	8	4	1	
NATAL					
Asbestos—tons	41	56	5		
Coal—do	3,202,756	3,374,503	3,462,108	4,076,374	4,478,26
Coke, metallurgical—do	19,502	23,183	38,405	53,926	67,43
Gold, fine—grams	6,532	840	2,644	9,082	3,70
Gypsum [2]	($13,659)				
Iron ore—tons		303	449		
Kaolin—do			18	30	
Mineral paint ores—do	464	70	206	203	
Silver, fine—kilograms	1	(5)	(5)	(5)	(5)
Stone:					
Granite [2]	($6,251)	($11,455)	($20,834)	($128,884)	($143,065)
Sandstone [2]	($2,152)	($6,428)	($10,463)	($43,363)	($58,752)
ORANGE FREE STATE					
Coal—tons	925,835	873,713	700,934	832,862	942,818
Gems: Diamonds—carats	282,307	147,498	116,381	237,875	298,618
Gypsum [2]	($33,474)	($32,828)	($19,031)	($17,856)	($6,523)
Stone: Sandstone [2]	($18,565)	($18,733)	($17,456)	($11,396)	($18,373)
TRANSVAAL					
Abrasives:					
Corundum—tons	223	112	1,836	2,543	1,695
Diatomaceous earth—do			[2] ($9,277)	217	236
Arsenic, white—do	10	2	3	5	96
Asbestos—do	3,212	1,445	1,263	3,698	3,847
Chromite, crude—do		1,078	87		4,572
Coal—do	6,788,556	6,562,061	5,102,364	6,337,519	6,393,618
Coke, metallurgical—do	172	1,041			128
Copper, fine—kilograms	817,369	907		5,329,683	5,558,292
Flint—tons	[2] ($4,507)	[2] ($1,147)	[2] ($2,057)	[6] 7	
Fluorspar—do	[2] ($14,656)	[2] ($693)	[2] ($3,435)	10,975	10,192
Gems: Diamonds—carats	929,305	435,744	415,707	680,933	851,661
Gold, fine—grams	253,749,227	252,830,275	218,028,155	284,558,625	297,813,280
Graphite—tons	66	43	38	54	50
Iron:					
Ore—do	2,238	1,889	1,464	521	
Pig iron—do	1,368	1,041			
Jade [2]					($1,395)
Lead:					
Ore and concentrates [7]—tons	538	206	(8)	(8)	(8)
Metal [9]—do			4,261	5,099	4,60
Magnesite—do	1,287	1,317	962	1,240	1,825
Manganese ore—do	61	287	157	592	930
Mica—kilograms	695	1,146	3,301	14,219	734,659
Mineral paint ores—tons	22	36	60	14	288
Osmiridium, fine—grams		15,863	23,701	96,452	179,280
Pyrite, iron—tons	3,147	3,949	2,848	2,966	2,349
Silver, fine—kilograms	27,762	25,826	34,701	42,734	43,450
Slate [2]	($16,184)	($24,018)	($21,687)	($25,905)	($24,093)
Soda—tons		283	115	87	844

[1] Less than ½ ton (331 kilograms).
[2] Value only reported.
[3] Average lead content reported as follows: 1923, 69.95 per cent; 1924, 70.19 per cent.
[4] Average tin content reported as follows: 1920, 74.12 per cent; 1921, 75.59 per cent; 1922, 72.94 per cent; 1923, 76 per cent.
[5] Less than 1 kilogram.
[6] Value reported as $316.
[7] Average lead content reported as follows: 1920, 50.26 per cent; 1921, 84.66 per cent.
[8] Data not available.
[9] Estimated content of ore produced.

Mineral production of the Union of South Africa, 1920–1924, by Provinces—Continued

Province and mineral	1920	1921	1922	1923	1924
TRANSVAAL—continued					
Stone:					
Granite [3]	($70,448)	($85,640)	($55,645)	($27,151)	($191,955)
Limestone [3]			($3,715)	($6,297)	($3,309)
Marble [3]			($9)		
Sandstone [3]	($8,174)	($9,811)	($26,440)	($25,522)	($95,265)
Verdite [3]	($1,587)		($123)		
Talc and soapstone—tons	619	375	309	322	575
Tin concentrates [10]—do	2,088	1,124	693	1,392	1,786
Vanadium ore—do				65	
Zinc ore—do	2,131	1,161			

[3] Value only reported.

[10] Average tin content reported as follows: 1920, 69.32 per cent; 1921, 64.46 per cent; 1922, 68.31 per cent; 1923, 66.94 per cent; 1924, 66.06 per cent.

UNITED KINGDOM OF GREAT BRITAIN, IRELAND, AND THE ISLE OF MAN

Mineral production of Great Britain, Ireland, and the Isle of Man, 1920–1924 [1]

Mineral	1920	1921	1922	1923	1924
Alum shale—tons	5,628	2,886	2,527	4,937	1,736
Arsenic, white, and arsenic soot—do	2,029	1,049	994	1,631	3,258
Barite:					
Ground—do	65,180	25,065	12,159	11,927	14,063
Unground—do			29,447	32,268	41,583
Bauxite—do	11,197	2,305			
Briquets, fuel—do	2,474,398	1,081,204	1,353,614	1,167,532	1,208,610
Calcspar—do	[2]	1,827	6,557	9,229	9,455
Chalk—do	3,807,307	3,489,478	3,072,990	3,651,027	4,473,221
Chert, flint, etc—do	85,656	46,374	55,020	88,523	150,659
China stone—do	74,275	35,446	39,546	52,167	55,581
Chromite [3]—do	1,118		605	555	1,060
Clay:					
Fire clay—do	1,997,595	1,387,296	1,853,479	2,154,341	2,224,487
Kaolin—do	789,990	442,839	677,537	732,096	819,306
Potters' clay—do	165,997	160,735	169,027	213,823	229,578
Others, including shale—do	8,150,229	8,485,491	6,523,751	8,655,730	11,041,467
Coal:					
Anthracite—do	4,611,811	3,526,381	4,899,990	5,366,939	5,512,725
Bituminous—do	228,604,261	162,344,981	248,713,064	275,063,430	265,892,689
Lignite—do	152				
Coke:					
Gas house [4]—do	[5] 8,440,471	[5] 6,907,608	11,037,012	11,692,948	12,279,666
Metallurgical—do	12,813,849	4,647,382	9,180,765	13,633,678	12,958,049
Copper:					
Concentrates [6]—do	82	37			
Metal [7]—do	129	73	106	89	123
Precipitate [8]—do	197	102	170	140	195
Feldspar—do	[9] 3,419	1,107	843	3,298	1,070
Fluorspar—do	55,561	23,508	33,878	49,818	50,286
Fuller's earth—do	29,370	20,567	[10]	[10]	[10]
Gold, fine [7]—grams	1,073				
Gold ore—tons	1				
Gypsum—do	291,584	269,091	261,592	322,775	377,248
Iron:					
Ore [11]—do	12,881,147	3,526,218	6,946,233	11,049,758	11,227,951
Pig iron [12]—do	8,163,674	2,658,292	4,980,982	7,559,920	7,436,368
Jet—kilograms		445	59		
Lead:					
Concentrates [13]—tons	15,646	6,896	11,257	12,700	14,523
Metal [7]—do	11,137	5,241	8,555	9,651	11,037

[1] Ann. Repts. of Secretary for Mines and Chief Insp. Mines, Mines Dept., London, unless otherwise stated. Data for 1920 and 1921 include Ireland, but mineral statistics for Ireland are not available for later years.

[2] Small quantity of calcspar included with limestone.

[3] Average content of Cr_2O_3 reported as follows: 1920, not stated; 1922, 31 per cent; 1923, 33 per cent; 1924, 25 per cent.

[4] Includes coke breeze.

[5] Exclusive of coke used at the gas works, for which data are not available.

[6] Average copper content reported for 1921 as 28 per cent. Similar data for 1920 not available.

[7] Approximate quantity of metal obtainable by smelting from ores raised in the United Kingdom.

[8] Average copper content reported as follows: 1920, not stated; 1921, 59 per cent; 1922, 62 per cent; 1923, 64 per cent; 1924, 63 per cent.

[9] Figures as published by Imp. Min. Res. Bur., London.

[10] Data not available.

[11] Exclusive of bog ore, the production of which is reported as follows: 1920, 2,214 tons; 1921, 8,389 tons; 1922, 32,706 tons; 1923, 18,125 tons; 1924, 3,251 tons.

[12] Includes ferro-alloys.

[13] Average lead content reported, 1920 to 1924, inclusive, as 80 per cent.

Mineral production of Great Britain, Ireland, and the Isle of Man, 1920–1924
Continued

Mineral	1920	1921	1922	1923	1924
Manganese ore [14] tons	13,082	522	254	2,053	2,
Mineral paint ores (ocher, umber, etc.) tons	15,786	10,475	9,181	10,458	10,
Natural gas cubic meters	3,000	3,000	3,000	3,000	
Oil shale tons	2,888,205	1,896,860	2,645,790	2,906,546	2,902,
Petroleum do	381	347	127	138	
Pyrite:					
Arsenical do	1,197		360	741	
Iron do	6,766	4,006	5,760	7,019	5,
Salt:					
Brine do	1,985,459	1,302,609	1,756,017	1,860,170	2,016,
Rock do	109,818	36,285	26,998	38,494	43,
Sand:					
Molding and pig bed do	2,801,303	242,686	198,480	437,516	659,
Other, including gravel do		2,230,073	2,091,579	2,557,758	2,969,
Silver [7] kilograms	2,375	380	930	1,077	1,
Slate tons	218,724	241,159	235,124	208,440	292,
Soapstone do	367		51	189	
Steel, crude (ingots and castings) do	9,212,800	3,762,800	5,975,000	8,617,900	8,353,
Stone:					
Felsite do	[15]	[15]	55,654	38,767	36,
Ganister [16] do	314,995	152,979	284,374	600,839	644,
Igneous rocks do	[15] 5,710,903	[15] 5,832,141	6,023,108	6,855,336	7,551,
Limestone do	[2] 11,408,023	7,451,776	9,569,848	11,615,028	13,019,
Sandstone, exclusive of ganister do	1,903,871	1,914,797	2,174,653	2,319,498	2,572,
Strontium, sulphate of do	4,250	6,728	4,787	6,448	1,
Tin:					
Concentrates [17] do	4,936	1,095	660	1,788	3,
Metal [7] do	3,114	690	376	1,037	2,
Tungsten ore [18] do	96	81	3	2	
Uranium ore [19] do	61	77	399	4	
Zinc:					
Ore [20] do	5,145	827	1,646	2,158	2,
Metal [7] do	1,682	297	590	758	

[2] Small quantity of calcspar included with limestone.
[7] Approximate quantity of metal obtainable by smelting from ores raised in the United Kingdom.
[14] Average manganese content reported, 1920 to 1924, inclusive, as 30 per cent.
[15] Felsite included with igneous rocks.
[16] Includes silica rock and silica sand used as refractories.
[17] Average tin content reported as follows: 1920, not stated; 1921, 63 per cent; 1922, 57 per cent; 1923, 5 per cent; 1924, 56 per cent.
[18] Average content of WO_3 reported as follows: 1920, not stated; 1921, 64 per cent; 1922 and 1923, 70 per cent 1924, 68 per cent.
[19] Average content of U_3O_8 reported as follows: 1920, not stated; 1921 to 1923, inclusive, 2 per cent; 1924, 3 per cent.
[20] Average zinc content reported as follows: 1920, not stated; 1921 and 1922, 46 per cent; 1923 and 1924, 4 per cent.

Mineral production of Great Britain, Ireland, and the Isle of Man, 1920–1924, by States [1]

State and mineral	1920	1921	1922	1923	1924
ENGLAND					
Alum shale tons	5,628	2,886	2,527	4,937	1,736
Arsenic, white, and arsenic soot do	2,029	1,049	994	1,631	3,258
Barite do	53,283	18,710	39,920	38,815	41,203
Bog ore do	1,913	8,389	32,706	18,125	3,251
Briquets, fuel [2] do	82,422	21,857	51,810	14,947	23,207
Calcspar do	[3]	[4] 1,827	6,501	8,418	9,111
Chalk do	3,659,808	3,399,917	3,072,990	3,651,027	4,472,921
Chert, flint, etc do	84,298	44,760	53,009	83,049	146,579
China stone do	74,275	35,446	39,546	52,167	55,581
Clay:					
Fire clay do	[5]	899,255	1,289,570	1,514,377	1,537,182
Kaolin do	789,990	442,839	677,537	732,096	819,306
Potters' clay do	165,997	160,735	169,027	213,823	229,578
Other, including shale do	[5]	7,671,423	5,869,756	7,852,133	10,060,362
Coal, bituminous do	164,695,833	118,658,992	178,207,079	198,479,768	193,807,042
Coke:					
Gas house do	7,304,768	5,981,544	9,730,585	10,324,669	10,888,034
Metallurgical [4] do	12,297,203	4,437,672	8,830,174	13,046,867	12,456,924

[1] Annual Reports of Secretary for Mines and Chief Inspector for Mines, Mines Department, London.
[3] Output of Monmouthshire, England, included under Wales.
[2] Small quantity of calcspar included with limestone.
[4] Output of Wales included under England.
[5] Data by States not available.

Mineral production of Great Britain, Ireland, and the Isle of Man, 1920–1924, by States—Continued

State and mineral	1920	1921	1922	1923	1924
ENGLAND—continued					
Copper:					
Concentrates tons	82				
Precipitate do	119	77	113	106	135
Feldspar do	[5]	[5]	[5]	1,840	1,070
Fluorspar do	55,561	23,508	33,878	49,818	50,286
Fuller's earth do	29,370	20,567	[6]	[6]	[6]
Gypsum do	290,870	269,010	261,592	322,775	377,248
Iron:					
Ore [7] do	12,519,210	3,372,747	6,815,882	10,861,840	11,078,892
Pig iron [4] do	7,246,638	2,364,450	4,614,188	6,779,086	6,754,396
Jet kilograms		445	59		
Lead concentrates tons	7,699	5,355	6,686	8,463	10,419
Mineral paint ores do	14,018	9,661	8,862	10,184	10,236
Natural gas cubic meters	3,000	3,000	3,000	3,000	
Oil shale tons	1,751			71	
Petroleum do	381	347	127	138	317
Pyrite:					
Arsenical do	1,197		360	741	304
Iron do	6,301	4,006	5,722	7,019	5,658
Salt, rock [8] do	86,358	24,525	26,998	38,494	43,076
Sand:					
Molding and pig bed do	2,273,002	1,947,234	169,271	411,220	590,491
Other, including gravel do			1,793,626	2,181,327	2,556,731
Slate do	17,592	23,887	25,505	27,598	29,307
Steel, crude [4] do	[5]	3,170,000	5,194,600	7,344,900	7,088,100
Stone:					
Felsite do	[9]	[9]	[10]	610	561
Ganister do	[11]	73,243	129,563	342,268	451,097
Igneous rocks do	[9] 2,936,797	[9] 3,116,524	3,047,627	3,461,257	3,726,584
Limestone do	[3] 9,157,536	5,837,888	7,432,592	8,840,263	10,059,597
Sandstone do	[11] 1,478,355	1,402,946	1,692,094	1,739,166	2,024,835
Strontium, sulphate of do	4,250	6,728	4,787	6,448	1,473
Tin:					
Concentrates do	4,936	1,095	660	1,788	3,604
Metal do	3,114	690	376	1,037	2,018
Tungsten ore do	96	81	3	2	2
Uranium ore do	61	77	399	4	20
Zinc ore do	2,148	530	841	1,129	1,125
SCOTLAND					
Barite tons	5,331	350	116	4,057	13,563
Briquets, fuel do	140,909	98,675	64,464	42,868	57,813
Chert, flint, etc do				1,117	
Chromite do	1,118		605	555	1,060
Clay:					
Fire clay do	[5]	427,513	455,816	532,506	591,704
Other, including shale do	[5]	383,064	343,272	322,399	458,689
Coal:					
Anthracite do	219,720	198,553	342,102	415,683	461,510
Bituminous do	31,810,181	22,708,420	35,674,251	38,696,555	36,309,625
Coke:					
Gas house do	768,526	606,477	1,032,868	1,092,027	1,103,207
Metallurgical do	516,646	209,710	350,591	586,811	501,125
Feldspar do	[5]	[5]	[5]	1,458	
Iron:					
Ore do	283,867	108,673	87,919	101,356	56,503
Pig iron do	917,036	293,842	366,794	780,834	681,972
Lead concentrates do	6,011	1,353	4,433	4,026	3,884
Oil shale [12] do	2,886,454	1,896,860	2,645,790	2,906,475	2,902,960
Sand:					
Molding and pig bed do	434,727	437,766	29,209	26,296	68,763
Other, including gravel do			274,312	351,128	382,623
Slate do	3,499	8,656	9,261	13,939	16,227
Soapstone do			51	189	
Steel, crude do	[5]	592,800	780,400	1,273,000	1,264,900
Stone:					
Felsite do	[9]	[9]	[10] 55,654	38,157	35,923
Ganister do	[11]	24,404	37,402	77,072	46,159
Igneous rocks do	[9] 1,427,508	[9] 1,513,998	1,789,363	2,153,471	2,310,607
Limestone do	295,892	196,195	277,310	334,468	324,952
Sandstone do	[11] 200,534	189,527	212,885	260,668	281,288
Zinc ore do	[13] 1,451	66	117	106	4

[3] Small quantity of calcspar included with limestone.
[4] Output of Wales included under England.
[5] Data by States not available.
[6] Data not available.
[7] Exclusive of bog ore, which is listed separately.
[8] Brine salt is also produced, but data for the individual States are not available.
[9] Felsite is included with igneous rocks.
[10] Output of England included under Scotland.
[11] Ganister is included with sandstone.
[12] The average yield of Scottish oil shale is reported as 91 liters of oil and 18 kilograms of ammonium sulphate per ton of shale
[13] Output of Ireland included under Scotland.

Mineral production of Great Britain, Ireland, and the Isle of Man, 1920–1924, States—Continued

State and mineral	1920	1921	1922	1923	1924
WALES					
Barite tons	2,381	1,331	1,570	1,323	
Briquets, fuel [2] do	2,249,654	952,083	1,237,340	1,109,717	1,127,
Calcspar do	([3])	([4])	56	811	
Chalk do					
Chert, flint, etc do	1,119	1,394	2,011	4,357	4,
Clay:					
Fire clay do	([5])	47,528	108,093	107,458	95,
Other, including shale do	([5])	400,177	307,484	470,409	510,
Coal:					
Anthracite do	4,299,874	3,250,679	4,557,888	4,951,256	5,051,
Bituminous do	32,080,770	20,964,760	34,831,734	37,887,107	35,776,
Coke:					
Gas house do	161,059	125,487	259,726	263,238	274,
Metallurgical [4] do	([4])	([4])	([4])	([4])	([4])
Copper precipitate do	78	25	57	34	
Gold grams	1,073				
Gold ore tons	1				
Iron:					
Ore do	49,321	19,179	73,935	86,562	92,
Pig iron [4] do	([4])	([4])	([4])	([4])	([4])
Lead concentrates do	1,832	188	37	38	
Manganese ore do	13,082	522	254	2,053	2,
Mineral paint ores do	567	503	319	274	
Pyrite, iron do	64		38		
Sand and gravel do	23,168	23,562	23,610	25,171	29,
Slate do	195,993	206,431	200,199	163,663	240,
Steel, crude [4] do	([5])	([4])	([4])	([4])	([4])
Stone:					
Ganister do	([11])	55,332	117,409	181,499	147,
Igneous rocks do	932,466	892,550	1,136,203	1,180,892	1,408,
Limestone do	[3] 1,805,039	1,316,954	1,855,251	2,425,123	2,618,
Sandstone do	[11] 468,913	275,391	267,959	316,910	262,
Zinc ore do	1,009	231	[14] 688	[14] 923	[14] 1,
IRELAND					
Barite tons	4,185	4,674			
Bauxite do	11,197	2,305			
Bog ore do	301				
Briquets, fuel do	1,413	8,669			
Chalk do	147,499	89,561			
Chert, flint, etc do	239	220			
Clay and shale do	([5])	24,893			
Coal:					
Anthracite do	92,217	77,149			
Bituminous do	17,477	12,809			
Lignite do	152				
Coke: Gas house do	195,442	184,125			
Copper concentrates do		37			
Gypsum do	714	81	([6])	([6])	([6])
Iron ore [7] do	28,749	25,568			
Lead concentrates do	25				
Mineral paint ores do	1,201	311			
Pyrite, iron do	401				
Salt, rock [8] do	23,460	11,760			
Sand and gravel do	70,406	64,197			
Slate do	982	518			
Soapstone do	367				
Stone:					
Igneous rocks do	393,963	281,820			
Limestone do	147,574	96,775			
Sandstone do	70,078	46,933			
Zinc ore do	([12])				
ISLE OF MAN					
Clay and shale tons	([5])	5,934	3,239	10,789	11,801
Coke: Gas house do	10,676	9,975	13,833	13,014	13,635
Iron ore do		51			
Lead concentrates do	79			173	121
Sand and gravel do			31	132	131
Slate do	658	1,667	159	3,240	6,133
Stone:					
Igneous rocks do	20,169	27,249	49,915	59,716	106,170
Limestone do	1,982	3,964	4,695	15,174	16,002
Sandstone do	986		1,715	2,754	3,473
Zinc ore do	537		([14])	([14])	([14])

[2] Output of Monmouthshire, England, included under Wales.
[3] Small quantity of calcspar included with limestone.
[4] Output of Wales included under England.
[5] Data by States not available.
[6] Data not available.
[7] Exclusive of bog ore, which is listed separately.
[8] Brine salt is also produced, but data for the individual States are not available.
[11] Ganister is included with sandstone.
[12] Output of Ireland included under Scotland.
[14] Output of the Isle of Man included under Wales.

URUGUAY

Little attention has been paid to the development of the mineral resources of Uruguay. Indications of petroleum have been officially reported from various localities, but no important developments have taken place.

Deposits of other minerals reported include [63] arsenic, asbestos, borax, refractory clay, coal, copper, emery, gold, graphite, lead, manganese, marble, peat, slate, building stone, sulphur, talc, tin, and zinc. No data on production are available. Exports of talc are reported as follows: 1920, 1,801 tons; 1921, 1,755 tons; 1922, 609 tons; 1923, 996 tons.

VENEZUELA

Mineral production of Venezuela, 1920–1924[a]

Mineral	1920	1921	1922	1923	1924
Asbestos (exports)--kilograms--	950				
Asphalt--tons--	23,452	48,489	38,476	33,321	69,892
Briquets, fuel--do--	2,321	2,401	6,900	3,611	3,475
Coal--do--	30,377	[b] 22,094	[b] 20,782	[b] 18,050	[b] 16,695
Copper:					
Ore--do--	(c)	11,323	23,708	44,992	37,431
Matte--kilograms--				4,876,660	3,714,940
Gold, crude--grams--	585,977	348,835	540,045	390,291	353,355
Magnesite (exports)--tons--	2,000	2,400			
Petroleum, crude--do--	69,539	218,146	334,923	639,257	1,334,996
Salt [d]--do--	30,000	30,000	30,000	30,000	30,000

[a] Memoria del Ministerio de Fomento, Venezuela; Estadística mercantil y maritima, Min. de Hacienda, Venezuela, except as otherwise noted.

[b] Exclusive of the output of the State of Falcón, the annual production of which is approximately 8,000 tons.

[c] Data not available.

[d] Estimated annual output (Imp. Min. Res. Bur., London).

[63] Marstrander, R., Informe Preliminar sobre las Riquesas Minerales de la República Oriental del Uruguay. Inst. Geol. y Perforac., Bol. 2. Montevideo, 1916; Anuario estadístico de la Rep. Uruguay, Montevideo, 1919.

YUGOSLAVIA

Mineral production of Yugoslavia, 1920–1924 [1]

Mineral	1920	1921	1922	1923	1924
Abrasives: Millstones ---- tons	[2] 334	[3]	[3]	[4] 46	[3]
Antimony:					
Ore ---- do	[3]	[3]	[3]	546	1,7
Liquated ---- do	[3]	30	5	27	1
Oxide ---- do	[3]	[3]	[3]	[2]	
Regulus ---- do	[3]	34	12	[3]	
Asphalt ---- do					
Bauxite ---- do	[3]	10,021	31,290	32,631	18,4
Cement ---- do	[3]	[6] 352,415	[6] 450,650	[3]	[7] 29,2
Chromite, crude ---- do	[2] 10	10	15	[3]	3
Coal:					
Anthracite and bituminous ---- do	63,479	76,882	101,861	136,267	131,6
Lignite ---- do	3,348,882	[2] 986,316	3,624,707	3,864,998	4,053,6
Copper:					
Ore ---- do	[8] 425	75,566	96,775	123,240	145,1
Metal [9] ---- kilograms	2,436,300	4,144,000	5,354,000	6,787,670	8,101,0
Gold, fine [10] ---- do	100	124	216	191	24
Iron:					
Ore ---- tons	[11] 1,130	16,357	35,645	244,619	330,1
Pig iron ---- do	15,173	11,881	15,348	26,361	15,0
Lead:					
Ore ---- do	31,717	60,285	59,934	57,194	11,6
Metal [9] ---- do	5,099	4,828	8,497	9,260	11,4
Manganese ore ---- do	[2] 5,327	910	[12] 1,122	5,143	4,5
Molybdenum concentrates ---- do	[3]	[3]	1	[3]	
Pyrite ---- do	[12] 3,682	27,900	11,019	[3]	[7] 26,3
Salt ---- do	[14] 23,400	34,922	43,872	[14] 46,000	48,8
Silver, fine [10] ---- kilograms	467	496	834	764	9
Stone: Marble ---- tons	[2] 1,151	610	1,882	[3]	2,5
Zinc:					
Ore ---- do	278	126	228	618	5
Metal [9] ---- do	1,511	420	1,056	1,947	2,1

[1] Data furnished by the Government of Yugoslavia through the United States consulate, Belgrade, except as otherwise noted.
[2] Exports.
[3] Data not available.
[4] Number of stones, weight not reported.
[5] Data not available. A preliminary estimate of the output in the occupied zone of Dalmatia, published by the Italian Ministry of Agriculture, gives the production as 27,860 tons.
[6] Approximate production.
[7] Output of Serbia only.
[8] Production of Majdanpek mine only.
[9] Smelter output.
[10] Figures as published by the Director, United States Mint
[11] Output of Vares and Zenica mines only.
[12] Figures as published by Imp. Min. Res. Bur., London.
[13] Incomplete data.
[14] Approximate output (Imp. Min. Res. Bur., London).

GOLD, SILVER, COPPER, LEAD, AND ZINC IN IDAHO

(MINE REPORT)

By C. N. Gerry

PRODUCTION

SUMMARY

The value of the mine production of gold, silver, copper, lead, and zinc in Idaho in 1925 was 13 per cent greater than in 1924, because the increase in the quantity and value of copper, lead, and zinc much more than offset the large decrease in the output of gold. Metal market conditions were good, and the prices of the metals other than gold were higher. The total value of the metal output has gradually increased since 1921, when it was unusually low, and in 1925 it nearly reached the average annual value for the decade 1916 to 1925, which was $30,771,000. Since 1863, Idaho has yielded an output of the five metals valued at nearly $822,000,000; lead has supplied the largest part. Dividends for 1925, taken largely from the annual printed reports of the companies but partly estimated, amounted to $6,048,244. It is impossible to procure the exact total, as part of the dividend disbursement is paid from operations in other States, and the amount paid by certain lessees is not reported.

Mine production of gold, silver, copper, lead, and zinc in Idaho in 1925

	Number of producers	Ore and tailings	Gold [1]	Silver [1]	Copper	Lead	Zinc	Total value
		Short tons		*Fine ounces*	*Pounds*	*Pounds*	*Pounds*	
1925	275	[2] 1,827,715	$431,771	7,743,439	3,297,443	253,041,790	31,237,240	$30,662,621
Increase or decrease from 1924	+55	+115,727	−124,752	−49,715	+558,619	+4,091,498	+15,896,742	+3,612,744
Total, 1863–1925			135,615,470	282,156,793	143,546,911	7,636,647,258	508,979,988	821,661,250

[1] Includes placer production.
[2] Includes 31,767 tons of old tailings milled and 1,560 tons of old tailings sold to a smelter.

Tables printed in Mineral Resources for 1922 and subsequent years give the source of the different metals by kinds of ore and by years from 1911 to 1925. During that period 86 per cent of the gold was derived from dry and siliceous ore and from placers. About 78 per cent of the silver and about 82 per cent of the lead came from lead ore and most of the remainder from lead-zinc ore and zinc ore.

ORE

The quantity of ore and tailings sold or treated in Idaho in 1925 increased 7 per cent but was only 66 per cent of that for 1917, the banner year. Of the total, nearly 60 per cent was lead ore and 36 per cent was lead-zinc ore, siliceous ore represented 1 per cent, copper

ore nearly 3 per cent, and copper-lead ore and zinc ore less than 1 per cent. These ores had the following average values in recovered metals per ton: Dry gold ore, $5.94; dry gold and silver ore, $27.19; dry silver ore, $27.07; copper ore, $18.50; lead ore and old tailings, $17.15; zinc ore, $24.04; copper-lead ore, $44.73; and lead-zinc ore and old tailings, $15.52. The first-class shipping ore—63,344 tons—was largely lead ore; its average recoverable content as shipped is given on page 526. Most of the siliceous ore was either concentrated or smelted, but part of it was treated by amalgamation or cyanidation, as shown on page 524. The bulk of the copper ore, lead ore, copper-lead ore, and lead-zinc ore, and more than half of the zinc ore was milled; the results are presented in the table on page 525.

Ore and metals produced in Idaho in 1925

Source	Number of producers	Ore and old tailings		Gold		Silver	
		Short tons	Per cent	Fine ounces	Per cent	Fine ounces	Per cent
Dry gold ore	50	13,853	0.76	3,678.39	17.61	5,303	0.06
Dry gold and silver ore	6	434	.02	317.89	1.52	7,515	.10
Dry silver ore	11	3,848	.21	58.25	.28	112,093	1.45
Copper ore	11	51,004	2.79	2,785.20	13.33	711,874	9.19
Lead ore	101	[1] 1,088,564	59.56	1,048.63	5.02	4,791,497	61.88
Zinc ore	3	701	.04	2.03	.01	4,432	.06
Copper-lead ore	4	6,275	.34	26.31	.13	230,584	2.98
Lead-zinc ore	16	[2] 663,036	36.28	277.30	1.33	1,877,329	24.24
Total lode mines		1,827,715	100.00	8,194.00	39.23	7,740,627	99.96
Total placers	85			12,692.92	60.77	2,812	.04
		1,827,715		20,886.92	100.00	7,743,439	100.00

Source	Copper		Lead		Zinc	
	Pounds	Per cent	Pounds	Per cent	Pounds	Per cent
Dry gold ore	3,694	0.11	23,560	0.01		
Dry gold and silver ore	89					
Dry silver ore	47,258	1.43	212,202	.08		
Copper ore	2,738,861	83.06	33,678	.01		
Lead ore	272,978	8.28	175,631,005	69.41		
Zinc ore			21,773	.01	155,748	0.50
Copper-lead ore	90,477	2.75	1,233,092	.49		
Lead-zinc ore	144,086	4.37	75,886,480	29.99	31,081,492	99.50
	3,297,443	100.00	253,041,790	100.00	31,237,240	100.00

[1] Includes 31,341 tons of old tailings milled and 1,560 tons of old tailings sold to a smelter.
[2] Includes 426 tons of old tailings milled.

GOLD ORE

Most of the gold ore came from the Golden Age property near Pioneerville, Boise County, and the Unity property near Warren, Idaho County. At the Gold Hill & Iowa property in Boise County, the largest producer of gold ore in recent years, the output has decreased steadily since 1921. In the past, the mines of Elmore, Idaho, Boise, and Lemhi Counties, and as recently as 1917 those at Elk City, were large producers of gold ore, but the yearly records show a marked decline since 1919 on account of high costs and transportation difficulties. The gold ore in 1925 yielded $5.49 in gold and 0.38 ounce of silver to the ton; also a small quantity of copper and lead.

Dry gold ore sold or treated in Idaho in 1925, with content in terms of recovered metals

County	Ore	Gold	Silver	Copper	Lead
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*
Ada	52	26.80	54	159	
Boise	9,917	1,660.16	3,874	3,260	11,250
Boundary	1,325	256.46	257		
Camas	18	23.64	23	6	314
Custer	26	20.60	36		
Elmore	54	53.62	22		
Gem	12	9.33	7		
Idaho	1,792	1,157.96	758		
Lemhi	240	154.30	114	269	11,996
Owyhee	29	44.14	82		
Shoshone	52	130.10	17		
Valley	36	16.08	7		
Washington	300	125.20	52		
	13,853	3,678.39	5,303	3,694	23,560

GOLD AND SILVER ORE

Mines in Owyhee County shipped several hundred tons of gold and silver ore, which yielded $15.14 in gold and 17.32 ounces of silver to the ton. The main producer was the Neversweat mine, near Silver City.

SILVER ORE

Small lots of silver ore were mined at Silver City, Hailey, Idaho City, and Lakeview, but most of it came from mines near Big Creek and Kellogg, Shoshone County. Bonner County also produces considerable copper ore which is valuable mainly for its silver content. The silver ore of the State as a whole yielded 31 cents in gold and 29.13 ounces of silver to the ton, as well as 2.76 per cent of lead and a small quantity of copper.

Dry silver ore sold or treated in Idaho in 1925, with content in terms of recovered metals

County	Ore	Gold	Silver	Copper	Lead
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*
Blaine	22	4.57	2,860	230	28
Boise	40	1.60	455		
Bonner	10	.24	821	83	
Owyhee	22	51.00	10,515	34	
Shoshone	3,754	.84	97,442	46,911	212,174
	3,848	58.25	112,093	47,258	212,202

COPPER ORE

Copper ore was mined in Custer, Shoshone, and Bonner Counties chiefly; most of it, or 48,235 tons, was milled. Copper ore from Lemhi and Bonner Counties decreased materially, but there was a notable increase in the copper from ore mined in Custer and Shoshone Counties. Larger shipments from the property of the Idaho Metals Co. near Mackay and from the Snow Storm and Crescent mines in Shoshone County more than offset the declines in Lemhi and Bonner Counties. The average recovered content of all copper ore shipped or treated was $1.13 in gold and 13.96 ounces of silver to the ton, 2.69 per cent of copper, and a little lead.

Copper ore sold or treated in Idaho in 1925, with content in terms of recovered metal.

County	Ore	Gold	Silver	Copper	Lead
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*
Bonner	9,206	649.10	385,191	149,230	33,678
Custer	29,758	2,109.03	35,492	2,353,833	----------
Latah	54	1.20	35	12,834	----------
Lemhi	175	14.99	1,945	26,262	----------
Shoshone	11,811	10.88	289,211	196,702	----------
	51,004	2,785.20	711,874	2,738,861	33,678

LEAD ORE

Most of the lead ore, which has been the most valuable mine product of Idaho since the Coeur d'Alene region became productive, was milling ore from Shoshone County. Operators in Boundary, Lemhi, and Bonner Counties also mined and shipped much lead ore. The Bunker Hill & Sullivan property at Kellogg, in Shoshone County, was the leading producer of lead ore, and the Hecla mine at Burke followed.

The Continental mine in Boundary County led the mines in the other counties. Three mines in Idaho produced from lead ore alone 56 per cent of the State's total lead. The average recovered content of all lead ores and old tailings in 1925 was 4.40 ounces of silver to the ton, 0.01 per cent of copper, and 8.07 per cent of lead.

Lead ore and old tailings sold or treated in Idaho in 1925, with content in terms of recovered metals

County	Ore and old tailings	Gold	Silver	Copper	Lead
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*
Bannock	4	----------	----------	12	1,424
Bear Lake	6	----------	5	----------	4,749
Blaine	1,700	144.97	109,844	7,497	905,214
Boise	15	24.16	281	63	8,154
Bonner	7,057	43.73	54,704	1,061	270,198
Boundary	26,662	11.53	59,554	----------	3,016,297
Butte	4,048	1.33	8,392	646	1,233,463
Camas	4	2.14	63	26	2,268
Cassia	30	25.05	359	315	22,619
Clark	5	----------	19	----------	1,160
Custer	2,003	26.34	28,140	5,154	835,804
Lemhi	11,675	338.23	92,619	24,997	3,718,915
Shoshone	[1] 1,035,355	431.15	4,437,517	233,207	165,610,740
	1,088,564	1,048.63	4,791,497	272,978	175,631,005

[1] Includes 31,341 tons of old tailings milled and 1,560 tons of old tailings sold to a smelter.

COPPER-LEAD ORE

Some of the ore from Blaine and Custer Counties, especially that from the Ramshorn mine, contained enough copper to be classed as a copper-lead ore; it yielded 36.75 ounces of silver to the ton, 0.72 per cent of copper, and 9.82 per cent of lead. Most of it was milling ore from the Ramshorn mine near Bayhorse, which yielded copper-lead concentrate rich in silver.

ZINC ORE AND LEAD-ZINC ORE

Little zinc ore was sold in 1925, but the output of lead-zinc ore increased materially. Five mines in Shoshone County, with the Morning mine leading, produced most of the lead-zinc ore, nearly all of which was concentrated. It yielded 2.83 ounces of silver to the ton, 0.01 per cent of copper, 5.72 per cent of lead, and 2.34 per cent of zinc. Much of the increase was due to contracts made in May by agents of the Vieille Montagne Zinc Co., of Belgium.

Lead-zinc ore and old tailings sold or treated in Idaho in 1925, with content in terms of recovered metals

County	Ore and old tailings	Gold	Silver	Copper	Lead	Zinc
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*
Blaine	86	3.48	2,168	462	12,558	27,514
Bonner	23		117		6,363	5,630
Shoshone	[1] 662,927	273.82	1,875,044	143,624	75,867,559	31,048,348
	663,036	277.30	1,877,329	144,086	75,886,480	31,081,492

[1] Includes 426 tons of old tailings milled.

The accompanying table gives the kind and grade of zinc material marketed in 1925:

Zinc ore, lead-zinc ore, and concentrates (as marketed from Idaho mines and mills) sold to smelters in 1925

Classification	County	Quantity (dry weight)	Gross zinc	Average assay of ore or concentrate	Recovered zinc
		Short tons	*Pounds*	*Per cent*	*Pounds*
Oxidized zinc ore	Lemhi	41	18,352	22.38	14,682
Sulphide zinc ore	Shoshone	260	125,517	24.14	106,689
Oxidized lead-zinc ore	Blaine	28	22,999	41.07	19,549
Sulphide lead-zinc ore	Shoshone	94	64,884	34.51	55,151
Zinc and lead-zinc concentrates.	Blaine, Bonner, Shoshone, and Adams.	42,286	36,809,429	43.52	31,041,169
		42,709	37,041,181	43.36	31,237,240

GOLD

The mine production of gold in Idaho in 1925 declined 22 per cent and was decidedly lower than the average yearly output for the decade 1916 to 1925, which was about $662,500. The gold output from Idaho was decreasing steadily before 1920, but dredges in Elmore and Shoshone Counties brought up the output in 1923. In 1925, however, the gold from both lode and placer mines decreased, especially from placers worked by dredges. The lode mines yielded $169,385 in gold and the placers $262,386, of which $229,489 was won by dredges. The three main sources of gold—placers, gold ore, and copper ore—all showed a smaller yield except copper ore. The production of gold from mills using amalgamation and cyanidation declined to 2,698.67 ounces, or only 13 per cent of the total gold

output. Concentrates of all kinds yielded 21 per cent of the total gold, and crude ore shipped to smelters yielded 5 per cent of it. Since 1897 gold worth $5,638,238 has been recovered by dredges.

In 1925 only five mines had a gold output of more than $15,000 each—those of the Yukon Gold Co. at Murray, the South Park Dredging Co. at Featherville, the Idaho Metals Co. at Mackay, the the Unity mine at Warren, and the Golden Age mine at Pioneerville.

SILVER

In 1925 the mine production of silver in Idaho declined less than 1 per cent in quantity and was decidedly less than the yearly average of the decade 1916 to 1925, which was about 8,178,100 ounces. The output of silver in Shoshone County increased 5,917 ounces, and there were also increases in Custer, Blaine, and Boise Counties, but the output from Bonner, Boundary, Owyhee, and Lemhi Counties was smaller.

Concentrates yielded 82 per cent of the silver, shipping ore nearly 18 per cent, and placer bullion and gold and silver bullion from lode mines less than 1 per cent.

Six mines—the Morning, Hecla, Bunker Hill & Sullivan, Talache, Gold Hunter, and Tamarack & Custer—yielded more than 300,000 ounces of silver each. Other large producers of silver were the Crescent, Sunshine, Hercules, and Ramshorn mines.

COPPER

The mine production of copper increased 20 per cent in quantity through the increased output of the Idaho Metals Co. at Mackay. The average yearly output for the decade 1916 to 1925 was about 4,350,000 pounds, but during the last five years it has been less than 3,000,000 pounds. Production of copper in Custer County in 1925 was more than double that of 1924. Lemhi County showed a large decrease, and smaller decreases were noted in Bonner and Shoshone Counties. Lemhi County ranked second in output in 1923, but the output in 1925 was 92 per cent less than in 1924, due to the closing of the Pope Shenon mine near Salmon. The largest producers of copper in the State were the Idaho Metals Co. at Mackay, the Talache mine in Bonner County, the Crescent and Snow Storm mines in Shoshone County, and the Ramshorn mine near Bayhorse. Crude shipping ore of all kinds furnished 14 per cent and concentrates 86 per cent of the copper.

LEAD

In 1925 the mine production of lead increased nearly 2 per cent in quantity and nearly 11 per cent in value. The average price of lead rose from 8 cents a pound in 1924 to 8.7 cents in 1925. Shoshone County supplied nearly 96 per cent of the total output, and Lemhi, Boundary, Custer, and Butte Counties made a good production. Concentrates of all kinds yielded nearly 85 per cent and crude ore and old tailings smelted 15 per cent of the total.

Eight mines produced more than 2,000,000 pounds of lead each in 1925. Three of them—the Bunker Hill & Sullivan, Morning, and Hecla—yielded more than 50,000,000 pounds each; the other large producers were the Tamarack & Custer, Gold Hunter, Hercules, Idaho-Continental, Constitution, Pittsburg-Idaho, Frisco, Star, Ramshorn, Wilbert, and Latest Out mines.

ZINC

The mine production of zinc amounted to 31,237,240 pounds, more than double the output of 1924. The gain was due to metallurgical improvements and the increase of more than a cent a pound in the average price of the metal. The Callahan Lead-Zinc Co., near Sunset, north of Wallace, shipped no zinc ore in 1925, but the Morning, Star, Constitution, and Tamarack & Custer mines made decided increases. All the zinc concentrates, except a few lots from Blaine, Bonner, and Adams Counties, came from the Coeur d'Alene region, where the largest producers of zinc were the Morning, Constitution, Star, Success, and Tamarack & Custer mines. There was a general increase in shipments of ore and concentrate from the Pine Creek region, and the Star mine, operated through the Hecla shaft at Burke, became a regular shipper. Ore that was not milled locally was shipped to custom milling plants at Butte and Anaconda, Mont. The Bunker Hill South mill, equipped to make lead and zinc products by flotation, treated lead-zinc ore from the Star mine as well as custom ore from the Sidney mine on Pine Creek.

MINING AND METALLURGIC INDUSTRY

The generally prosperous condition of the mines of Idaho in 1925 was shown by the value of the production of the five metals, which exceeded that for any year since 1920. Early in the year no effort was made to increase output, but as the price of lead and zinc gradually rose much interest was shown in augmenting production and in prospecting for deposits of lead and zinc ores. Favorable conditions prevailed for the employment of labor and for the treatment and marketing of various ores. Renewed interest in mining investments and energetic development work resulted in the opening of several large ore deposits, notably that of the Livingston property in Custer County. Perhaps the most interesting feature of the year was the improved metallurgical results attained at several of the large milling plants and the installation of additional machinery to make separate high-grade lead and zinc products. One of the incentives to this work was the new market for zinc concentrate when the Vieille Montagne Zinc Co., of Chenee, Belgium, made contracts in May for concentrate from the Success, Tamarack & Custer, Highland Surprise, and Star mines. In fact, at the end of the year the prospects for an increased production of lead and zinc were unusually good, though the outputs of gold and silver were falling below normal.

In Idaho 52 milling plants of all kinds were active in 1925, against 53 in 1924. Of these mills 32 were concentration plants, 18 of which used flotation machines with other concentrating devices, 5 used flotation alone, and 9 used crushers, jigs, and tables, without flotation cells; 17 used amalgamation alone; 1 used cyanidation; and 2 used amalgamation with concentration tables. Several new mills were in course of construction and others were adding flotation equipment or being changed to regular flotation plants. The Bureau of Mines, Washington, D. C., has issued a revised list of ore-milling plants, which gives the general features of plants in Idaho and other States. This list may be had on request.

Less than one-half of 1 per cent of the ore—5,889 tons—was treated in gold and silver mills; the gold and silver recovered from this ore by amalgamation and cyanidation were valued at $57,626, or $9.79 per ton of ore treated. Nearly all the gold in bullion was won by amalgamation. The companies purchased 185 pounds of quicksilver and used 3,900 pounds of sodium cyanide in 1925. The average amount of quicksilver purchased was 0.041 pound per ton of ore amalgamated and 0.042 pound per ounce of gold and silver bullion saved. The consumption of cyanide was 3.96 pounds per ounce of gold and silver recovered.

Gold and silver produced at mills in Idaho in 1925, by counties

County	Ore (short tons)	Bullion (fine ounces) recovered from ore by—				Total value
		Amalgamation		Cyanidation		
		Gold	Silver	Gold	Silver	
Ada	4	5.37	2			$112
Boise	1,947	810.36	170	1.60	455	17,219
Boundary	1,325			256.46	257	5,479
Camas	7	8.04	4			169
Custer	26	20.60	36			451
Elmore	54	53.62	22			1,123
Gem	12			9.33	7	198
Idaho	1,786	1,095.82	754			23,176
Lemhi	[1] 230	102.11	20			2,125
Owyhee	[2] 110	63.98	848			1,912
Shoshone	52	130.10	17			2,701
Valley	36	16.08	7			337
Washington	300	125.20	52			2,624
	5,889	2,431.28	1,932	267.39	719	57,626

[1] Also yielded 15 tons of lead concentrate.
[2] Also yielded 3 tons of siliceous concentrate.

Of the total ore and tailings 96 per cent was concentrated. Metals recovered from the concentrates—from ore milled, from 31,767 tons of old tailings, and from ore treated in gold and silver mills—were valued at $96.88 a ton, against $85.81 in 1924. The concentrates came largely from the Coeur d'Alene region, and the ratio was 6.57 tons of ore and tailings to 1 ton of concentrate. Increases of both zinc concentrate and lead-zinc concentrate nearly compensated for a decrease of 20,084 tons in lead concentrate. Operators in Shoshone County shipped an average of 21,265 tons of concentrates of various kinds a month, against 21,262 tons in 1924. This amount, with the crude ore shipped (4,307 tons a month), gives the Coeur d'Alene region an average monthly output of 25,572 tons of concentrates and crude ore, against 25,380 tons in 1924. The average value of metals recovered from the lead concentrate rose from $87.16 to $99.70 a ton; that from lead-zinc concentrate rose from $59.54 to $74.06. The copper concentrate and the copper-lead concentrate both increased considerably and were especially valuable for their high content of silver.

Mine production of metals from Idaho concentrates in 1925

BY COUNTIES

	Ore to concentrating mills	Concentrates	Gold	Silver	Copper	Lead	Zinc	Total value of metal
	Short tons	*Short tons*	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*	
Adams	400	37		1,628			34,377	$3,743
Blaine	358	42	3.38	2,732	143	29,167	7,965	5,128
Boise	8,000	241	815.80	3,501	3,080	10,841		20,675
Bonner	16,127	1,637	690.34	432,717	149,505	158,599	5,630	350,033
Boundary	26,635	2,421		59,244		3,007,229		302,744
Butte	4,042	1,094	.44	8,087	604	1,229,824		112,702
Custer	35,026	6,187	1,961.22	238,774	2,230,594	1,285,110		634,800
Lemhi	5,107	331	67.99	6,671	13,860	252,985		30,013
Owyhee	360	11	266.19	6,373	89			9,939
Shoshone	[1]1,629,100	[2]255,186	643.86	5,617,394	447,749	207,880,224	30,993,197	24,416,423
	1,725,155	267,187	4,449.22	6,377,121	2,845,624	213,853,979	31,041,169	25,886,200

BY KINDS OF CONCENTRATES

Dry and siliceous	311	1,089.48	12,622	5,258	12,449		$33,112
Copper	6,576	2,580.00	696,282	2,416,822	33,678		882,672
Lead	[3]216,850	516.67	5,188,180	253,133	206,582,800		21,619,927
Zinc	8,504	25.78	28,368	12,740	576,345	6,972,165	602,056
Copper-lead	1,164	24.90	201,284	79,516	1,093,199		246,605
Lead-zinc	[4]33,782	212.39	250,385	78,155	5,555,508	24,069,004	2,501,828

AVERAGE RECOVERABLE CONTENT

	Short tons	*Fine ounces*	*Fine ounces*	*Per cent*	*Per cent*	*Per cent*	*Value per ton*
Dry and siliceous	311	3.50	40.59	0.85	2.00		$106.47
Copper	6,576	.39	105.88	18.38	.26		134.23
Lead	216,850		23.93	.06	47.63		99.70
Zinc	8,504		3.34	.07	3.39	40.99	70.80
Copper-lead	1,164	.02	172.92	3.42	46.96		211.86
Lead-zinc	33,782	.01	7.41	.12	8.22	35.62	74.06
	267,187	.02	23.87	.53	40.02	5.81	96.88

[1] Also 31,767 tons of old tailings milled.
[2] Includes 3,082 tons of concentrates from 31,767 tons of old tailings milled.
[3] Includes 3,037 tons of concentrates from 31,341 tons of old tailings milled.
[4] Includes 45 tons of concentrates from 426 tons of old tailings milled.

Of the total ore more than 3 per cent was shipped crude to smelters at Bradley, Idaho; East Helena and Anaconda, Mont.; Tacoma, Wash.; Selby, Calif.; and near Salt Lake City, Utah. The total value of the metals recovered from first-class ore was $4,441,749, as compared with $3,865,562 in 1924. Of the crude ore shipped, 89 per cent was lead ore; the remainder was largely siliceous ore and copper ore. Most of the ore smelted was sulphide, though 13 per cent of the lead ore was carbonate. The combined value of the metals from concentrates and crude shipping ore was $30,327,949, compared with $26,542,026 in 1924.

Mine production of metals from Idaho crude ore shipped to smelters in 1925

BY COUNTIES

	Ore	Gold	Silver	Copper	Lead	Zinc	Total value of metal
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*	
Ada	48	21.41	52	159			$50
Bannock	4			12	1,424		12
Bear Lake	6		5		4,749		41
Blaine	1,463	150.05	112,362	8,861	890,177	19,549	161,26
Boise	25	58.16	484	243	8,563		2,31
Bonner	169	2.73	8,116	869	151,640		19,00
Boundary	27	11.53	310		9,068		1,24
Butte	6	.89	305	42	3,639		553
Camas	15	17.74	82	32	2,582		653
Cassia	30	25.05	359	315	22,619		2,780
Clark	5		19		1,160		114
Custer	2,997	200.05	55,220	218,055	782,242		141,477
Idaho	6	62.14	4				1,288
Latah	54	1.20	35	12,834			1,871
Lemhi	6,794	337.42	88,990	37,668	3,478,199	14,682	377,802
Owyhee	15	82.86	10,891	34			9,276
Shoshone	51,680	74.86	1,080,103	172,695	33,713,742	161,840	3,721,058
	63,344	1,046.09	1,357,337	451,819	39,069,804	196,071	4,441,749

BY KINDS OF ORE

Dry and siliceous	3,556	221.09	109,546	45,514	211,317		$105,442
Copper	2,769	205.20	15,592	322,039			60,793
Lead	56,434	614.87	1,199,293	72,986	38,676,630		4,220,251
Zinc	301	2.03	2,804		21,773	121,371	13,106
Copper-lead	162	1.41	29,300	10,961	139,893		34,090
Lead-zinc	122	1.49	802	319	20,191	74,700	8,067

AVERAGE RECOVERABLE CONTENT

	Short tons	*Fine ounces per ton*	*Fine ounces per ton*	*Per cent*	*Per cent*	*Per cent*	*Value per ton*
Dry and siliceous	3,556	0.06	30.81	0.64	2.97		$29.65
Copper:							
Oxidized	41		45.22	11.17			63.24
Sulphide	2,728	.08	5.04	5.73			21.33
Lead:							
Oxidized	7,342	.05	12.93	.18	25.45		54.77
Sulphide	49,092		22.50		35.59		77.77
Zinc:							
Oxidized	41		24.46		.33	17.91	44.78
Sulphide	260	.01	6.93		4.14	20.52	43.35
Copper-lead: Sulphide	162	.01	180.86	3.38	43.18		210.43
Lead-zinc:							
Oxidized	28	.04	16.43	.57	5.35	34.91	76.18
Sulphide	94		3.64		9.15	29.34	63.13
	63,344	.02	21.43	.36	30.84	.15	70.12

REVIEW BY COUNTIES AND DISTRICTS

Mine production of gold, silver, copper, lead, and zinc in Idaho in 1925

County	Gold					Silver [1]	
	Placers		Lode mines		Total value	Fine ounces	Value
	Fine ounces	Value	Fine ounces	Value			
Ada	6.48	$134	26.80	$554	$688	55	$38
Adams	7.01	145			145	1,628	1,130
Bannock	2.22	46			46		
Bear Lake						5	4
Benewah	1.60	33			33		
Bingham	34.59	715			715	2	1
Blaine			153.44	3,172	3,172	115,094	79,875
Boise	562.84	11,635	1,685.92	34,851	46,486	4,761	3,304
Bonner			693.07	14,327	14,327	440,833	305,938
Bonneville	18.43	381			381		
Boundary			268.00	5,540	5,540	59,811	41,509
Butte			1.31	27	27	8,392	5,824
Camas			25.78	533	533	86	60
Canyon	1.21	25			25		
Cassia			25.06	518	518	359	249
Clark						19	13
Clearwater	59.31	1,226			1,226	12	8
Custer	12.91	267	2,181.86	45,103	45,370	294,032	204,058
Elmore	5,545.03	114,626	53.65	1,109	115,735	1,859	1,290
Gem	9.53	197	9.34	193	390	7	5
Idaho	440.46	9,105	1,157.95	23,937	33,042	832	578
Jerome	5.47	113			113		
Latah	7.35	152	1.21	25	177	35	24
Lemhi	146.63	3,031	507.50	10,491	13,522	95,694	66,412
Owyhee			413.02	8,538	8,538	18,112	12,570
Power	7.55	156			156		
Shoshone	5,766.15	119,197	848.84	17,547	136,744	6,701,747	4,651,013
Twin Falls	7.98	165			165		
Valley	24.43	505	16.06	332	837	9	6
Washington	25.74	532	125.19	2,588	3,120	55	38
Total, 1924	12,692.92	262,386	8,194.00	169,385	431,771	7,743,439	5,373,947
	17,324.10	358,121	9,597.70	198,402	556,523	7,793,154	5,221,413

County	Copper		Lead		Zinc		Total value
	Pounds	Value	Pounds	Value	Pounds	Value	
Ada	159	$23					$749
Adams					34,377	$2,612	3,887
Bannock	12	2	1,424	$124			172
Bear Lake			4,749	413			417
Benewah							33
Bingham							716
Blaine	9,004	1,279	919,344	79,983	27,514	2,091	166,400
Boise	3,323	472	19,404	1,688			51,950
Bonner	150,374	21,353	310,239	26,991	5,630	428	369,037
Bonneville							381
Boundary			3,016,297	262,418			309,467
Butte	646	92	1,233,463	107,311			113,254
Camas	32	4	2,582	225			822
Canyon							25
Cassia	315	45	22,619	1,968			2,780
Clark			1,160	101			114
Clearwater							1,234
Custer	2,448,649	347,708	2,067,352	179,859			776,995
Elmore							117,025
Gem							395
Idaho							33,620
Jerome							113
Latah	12,834	1,822					2,023
Lemhi	51,528	7,317	3,731,184	324,613	14,682	1,116	412,980
Owyhee	123	17					21,125
Power							156
Shoshone	620,444	88,103	241,711,973	21,028,942	31,155,037	2,367,783	28,272,585
Twin Falls							165
Valley							843
Washington							158
Total, 1924	3,297,449	468,237	253,041,790	22,014,636	31,237,240	2,374,030	30,662,621
	2,738,824	358,786	248,950,292	19,916,023	15,340,498	997,132	27,049,877

[1] Includes placer production.

Ore and old tailings sold or treated, lode mines producing, and average value of o and tailings in Idaho, 1924–25

County	Ore and old tailings sold or treated in 1925 (short tons)		Number of lode mines producing		Average total value per ton [1]		Average valu per ton in gol and silver [1]	
	Total	Increase or decrease	1924	1925	1924	1925	1924	1925
Ada	52	+46	2	2	$29.00	$11.81	$29.00	$11.
Adams	400	−100	1	1	5.92	9.36	2.68	2.
Bannock	4	+4	----	1	----	31.50	----	----
Bear Lake	6	−1	1	1	64.86	69.50	.43	.
Blaine	1,821	−781	18	28	52.68	91.38	26.68	45.
Boise	9,972	−4,275	12	13	5.26	4.03	5.26	3.
Bonner	16,296	−3,084	6	10	20.46	22.65	18.35	19.
Boundary	27,987	−6,968	1	2	12.53	11.06	1.93	1.
Butte	4,048	+2,585	5	4	37.82	27.98	7.10	1.
Camas	22	−48	5	5	34.04	37.36	25.73	26.
Cassia	30	+12	1	2	106.72	92.67	23.39	25.
Clark	5	+5	----	1	----	22.80	----	2.
Custer	38,049	+18,713	13	19	24.50	20.41	9.67	6.
Elmore	54	−206	2	5	7.57	20.81	7.57	20.
Gem	12	+8	2	1	22.25	16.50	22.25	16.
Idaho	1,792	−637	7	8	13.57	13.65	13.57	13.
Kootenai	----	−4	1	----	82.00	----	77.50	----
Latah	54	+27	1	1	41.74	34.65	.85	.
Lemhi	12,131	−6,324	18	22	28.06	33.79	4.09	6.
Owyhee	485	−1,059	8	13	21.91	43.56	21.77	43.
Shoshone	[2] 1,714,159	+117,879	35	48	15.36	16.42	2.82	2.
Valley	36	−365	2	2	5.49	9.36	5.49	9.
Washington	300	+300	----	1	----	8.75	----	8.
	1,827,715	+115,727	141	190	15.59	16.63	3.16	3.

[1] Placer product excluded.
[2] Includes 31,767 tons of old tailings milled and 1,560 tons of old tailings sold to a smelter.

Number and production of producing placer mines in Idaho, 1924–25

County	1924						1925					
	Mines			Gold	Silver (fine ounces)	Total value	Mines			Gold	Silver (fine ounces)	Total value
	Hydraulic and sluicing	Dredge	Drift				Hydraulic and sluicing	Dredge	Drift			
Ada	1	----	----	$475	4	$478	4	----	----	$134	1	$13
Adams	2	----	----	453	5	456	1	----	----	145	----	14
Bannock	----	----	----	----	----	----	1	----	----	46	----	4
Benewah	----	----	----	----	----	----	1	----	----	33	----	3
Bingham	1	----	----	231	1	232	4	----	----	715	2	71
Boise	7	----	----	2,539	27	2,557	10	----	----	11,635	151	11,74
Bonneville	1	----	----	300	----	300	2	----	----	381	----	38
Camas	2	----	----	165	2	166	----	----	----	----	----	----
Canyon	----	----	----	----	----	----	1	----	----	25	----	2
Clearwater	4	----	----	871	7	876	6	----	----	1,226	12	1,23
Custer	5	----	----	831	7	836	3	----	----	267	2	26
Elmore	2	1	----	180,430	2,965	182,417	3	1	----	114,626	1,837	115,90
Gem	----	----	----	----	----	----	2	----	----	197	----	19
Idaho	24	----	1	4,931	42	4,959	19	----	1	9,105	74	9,15
Jerome	2	----	----	157	----	157	1	----	----	113	----	11
Latah	3	----	----	593	1	594	1	----	----	152	----	15
Lemhi	8	----	----	3,957	29	3,976	8	----	1	3,031	13	3,04
Owyhee	2	----	----	33	10	40	----	----	----	----	----	----
Power	1	----	----	44	----	44	1	----	----	156	----	15
Shoshone	2	1	1	161,486	1,144	162,252	3	1	1	119,197	715	119,69
Twin Falls	4	----	----	178	----	178	3	----	----	165	----	16
Valley	3	----	----	193	2	194	3	----	----	505	2	50
Washington	1	----	----	254	2	255	3	----	----	532	3	53
	75	2	2	358,121	4,248	360,967	80	2	3	262,386	2,812	264,33

ADA COUNTY

Black Hornet district.—Several cars of gold ore were shipped from the McCarty group to the smelter at International, Utah.

Boise River district.—A little placer gold was saved from the banks of Boise River near Kuna and Meridian.

Highland district.—Gold bullion from the Maynard property and placer gold from near Barber made up the district output of gold and silver, valued at $129.

Snake River district.—A little placer gold was recovered from the Orofino claim on Snake River near Melba.

ADAMS COUNTY

Meadows district.—Small lots of placer gold were recovered from a property near New Meadows west of Snake River.

Seven Devils district.—The American Mining Co. worked the Azurite mine east of Snake River near Homestead, Oreg.; it treated several hundred tons of zinc ore by concentration and flotation and shipped zinc concentrate containing silver to Antwerp, Belgium. Only assessment work was done by the Idaho Copper Co. (Ltd.), which owns the Red Ledge mine, where tunnels and diamond drill work are said to have exposed 2,000,000 tons of low-grade copper ore.

BANNOCK COUNTY

One test lot of sulphide lead ore was shipped from the Covert and Miller property near Mink Creek. The prospect is opened by 200 feet of drifts and shafts.

BEAR LAKE COUNTY

St. Charles district.—A small lot of lead ore was shipped from the Blackstone property near Paris.

BENEWAH COUNTY

A small lot of placer gold was shipped from claims on Tyson Creek, which produced considerable gold from 1901 to 1920. There was no output from the Ellensberg property, though it was often mentioned in mining journals.

BINGHAM COUNTY

Snake River district.—Gold valued at $715 and 2 ounces of silver were recovered from the banks of Snake River near Aberdeen.

BLAINE COUNTY

The value of the mine production of metals in Blaine County increased $29,317 in 1925, but it was small when compared with that of past years since 1880 and was surpassed by that of five other counties. Much development work was done, especially in prospecting for the faulted ore body of the Minnie Moore mine at Bellevue, but that problem was not solved. From 1880 to 1925 Blaine County has produced $2,562,796 in gold, $16,326,877 in silver, $65,618 in copper, $8,958,086 in lead, and $652,463 in zinc, a total of $28,565,840. The quantities of the various metals follow: Gold, 123,977.01 fine ounces; silver, 17,877,006 fine ounces; copper, 376,686 pounds; lead, 200,317,581 pounds; and zinc, 8,054,874 pounds.

Mineral Hill district (*Hailey*).—Eighteen lode mines in the Mineral Hill district produced 322 tons of ore yielding $432 in gold, 24,519 ounces of silver, 3,460 pounds of copper, 208,629 pounds of lead, and 7,965 pounds of zinc, valued in all at $36,695, or $113.96 a ton. Most of the ore—264 tons—was first-class lead ore shipped for smelting. The output was made up chiefly of small lots from various properties. The Star mine, 3 miles south of Hailey, shipped several cars of rich lead ore, some of which, like that mined in the district during the old days, averaged 65 per cent of lead and contained 159 ounces of silver to the ton. The mine is opened by 300 feet of tunnels and stopes.

Development work was continued through the Allen shaft of the Minnie Moore property, which was under lease to the Boericke interests of Philadelphia, Pa., but no ore was shipped from the sensational strike reported early in 1925. Lead ore was shipped from the Belmont, Bromide, Eureka, Hope, Jennie R., Le Grande, Red Cloud, Utah-Bellevue, Woodrow, Silver Bell, and Jay Gould properties.

Sawtooth district.—One small lot of silver ore was shipped from the Eastern Star property near Obsidian.

Vienna district.—One car of rich silver ore was shipped from the Vienna mine on Smiley Creek, 48 miles west of Ketchum.

Warm Springs district (*Ketchum*).—Eight lode mines in the Warm Springs district produced 1,485 tons of ore that yielded $2,655 in gold, 88,119 ounces of silver, 5,511 pounds of copper, 710,687 pounds of lead, and 19,549 pounds of zinc, valued in all at $127,909, or $86.13 a ton. The output consisted of 300 tons of mill ore and 1,185 tons of shipping ore. The Independence mine, owned by the Federal Mining & Smelting Co., of Wallace, was worked by lessees and nearly a thousand tons of silver-lead ore shipped to Murray, Utah. Production, however, was small compared with the output of past years.

According to the Federal Mining & Smelting Co.'s annual report to stockholders, the lessees paid $20,182 in royalty, and the ore contained 96 ounces of gold, 78,125 ounces of silver, and 584,000 pounds of lead. Both the Independence and the North Star mills were idle The North Star property is said to contain considerable lead-zinc ore difficult to treat economically. The Hailey Bonanza Mining Co. operated its 150-ton concentration plant for a short time, testing ore from the Imperial lode. About 500 feet of development work was done in various tunnels. Several cars of oxidized lead ore and lead-zinc ore were shipped from the Homestake property and two cars of sulphide lead ore from the Boyle Mountain mine. Other producers were the Baltimore and Victoria, Chloride Point, White Elephant, and Golden Glow properties.

BOISE COUNTY

The value of the mine production of metals in Boise County decreased from $77,499 in 1924 to $51,950 in 1925. The placer production was valued at only $11,740, as no dredging was done. The main decrease was due to the gradual decline in the output of the Gold Hill & Iowa property, which in 1921 produced gold valued at more than $200,000.

Banner district.—A little gold ore was treated by amalgamation at the Choowathoo property, and silver bullion was recovered from ore treated at the Edna mine under lease.

Boise Basin district (Centerville, Placerville, Idaho City, Pioneerville).—Nine placers and ten lode mines in the Boise Basin district produced 9,923 tons of ore, $46,329 in gold, 4,303 ounces of silver, 3,323 pounds of copper, and 19,404 pounds of lead, valued together at $51,475. The ore had an average value of $4.01 in metals per ton. The placer output consisted of $11,603 in gold and 151 ounces of silver. The largest output in the district was that of the Golden Age Junior Mining Co. (Ltd.) at Pioneerville, where several thousand tons of gold ore was treated in the 100-ton flotation plant, which operated about half the year. The surface plant was burned in June but was rebuilt immediately. The company is said to have 30,000 tons of siliceous gold ore in reserve, as well as copper, lead, and zinc ore in a separate vein.

The production of gold bullion from the Gold Hill & Iowa property, a large producer in the past, was decidedly small, as the property was idle part of the time or in the hands of various lessees, including the Utah Majestic Mines Co. On the 250-foot level there is a good showing of clean zinc ore, but none was marketed. At the Belshazzar mine, operated by the Idawa Gold Mining Co., development work consisted of 1,625 feet of drifts, crosscuts, and raises. Low-grade ore was treated in a small test mill equipped for amalgamation and concentration. Some gold ore from the Hay Fork mine was treated in a 40-ton Marathon mill. One lot of lead ore containing considerable gold and silver was shipped by the Mineral Mining Co., which was constructing a 100-ton milling plant equipped with rolls, jigs, tables, and flotation cells. Much ore containing silver, lead, and zinc is blocked out. A little bullion was recovered in a 5-stamp mill from gold ore from the Mammoth property. At the Monetary Metals property 2,570 feet of development work was done; about 100,000 tons of $16 ore is said to be opened.

The Boise Placer Co. treated bench gravel by hydraulicking and was the largest producer of placer gold in the district. Other producers of placer gold were the Reid, Gold Eagle, Lucky Strike, Little Muddy, Lincoln, Swede Gulch, and Hally properties. No dredges were at work, but a plant of the Risdon type was being installed by the Consolidated Mines Syndicate, which owns 25 placer claims near Idaho City.

Summit Flat district.—A little gold ore from the Black Jack mine was treated in the King mill on Grimes Creek.

BONNER COUNTY

The value of the mine production of metals in Bonner County decreased $27,459 in 1925, though there was an increase in the lead output. The county took fourth place in value of output after Shoshone, Custer, and Lemhi Counties, due largely to the work at the Talache Mines (Inc.), which made a concentrate rich in silver.

Lakeview district.—Three lode mines in the Lakeview district produced 6,820 tons of ore yielding $905 in gold, 47,929 ounces of silver, 487 pounds of copper, and 74,556 pounds of lead, valued in all at $40,723, or $5.97 a ton. Nearly all the ore was concentrated. The largest producer was the Hewer Mining Co., which operated a

90-ton flotation plant several months on ore rich in silver. Silver-lead concentrate was shipped to the Bunker Hill smelter at Bradley. Development work during the year consisted of 1,000 feet of drifting and 200 feet of inclined shaft. A little silver ore was shipped from the Silver King property and some silver-lead ore from the Silver Leaf mine.

Pend d'Oreille district.—Five lode mines in the Pend d'Oreille district produced 9,442 tons of ore yielding $13,422 in gold, 392,350 ounces of silver, 149,366 pounds of copper, and 226,847 pounds of lead, valued in all at $326,659, or $34.60 a ton. As in recent years the largest producer was the Talache Mines (Inc.), which operated its mine the entire year but its mill only eight months. The ore, which is made up of various silver, copper, and lead minerals, including tetrahedrite and polybasite, was reduced to a copper concentrate containing a little lead and considerable silver; this concentrate was shipped to Tacoma, Wash. The mine was an important producer of silver, but the output was not as large as in 1924. High-grade silver-lead ore was shipped from the Elsie K. property, which is opened by three small tunnels. Some lead ore was milled by the Lawrence Consolidated Mining Co.

Priest Lake district.—The Kaniksu Mining Co., working the Woodrat mine, shipped a car of lead-zinc ore to the Bunker Hill custom mill at Kellogg for testing. A little silver-lead ore from the Jupiter claim was shipped to Murray, Utah.

BONNEVILLE COUNTY

From the Elizabeth and Clemens Bar properties, near Gray, which were worked by hydraulicking and sluicing, some placer gold was shipped to the assay office at Boise and to the mint at Denver, Colo.

BOUNDARY COUNTY

The value of the mine production of metals in Boundary County declined $128,644 in 1925, due to the decrease in silver and lead from the Idaho-Continental mine near Port Hill. Some gold was marketed from the Cynide mine, but no important discoveries were made in the county.

Moyie Yahk district.—The Buckhorn mine was operated by the Cynide Gold Mining Co. (Ltd.), and precipitates and gold bullion were marketed as a result of the short run of the new cyanide plant. One lot of sulphide lead ore was shipped as a test to the Bunker Hill smelter. As development proceeds at depth the ore is becoming base. During the year the power plant was damaged by high water and the spillway washed out. No clean-up was made from the Leonia property, which has extensive hydraulic equipment and 4,000 acres of placer and lode claims.

Port Hill district (*Klockmann*).—More than 2,000 tons of silver-lead concentrate was shipped by lessees of the Idaho-Continental Mining Co.'s property west of Port Hill. The mine is the largest producer of lead north of the Coeur d'Alene region, but concentrates were hauled only when the condition of the road permitted. Considerable diamond drilling was done from the No. 5 tunnel, which is 2,630 feet long and 400 feet below the No. 4 tunnel. Several of the shipments ran as high as 71 per cent of lead and 27 ounces of silver to the ton.

BUTTE COUNTY

The mine production of metals in Butte County in 1925 was valued at $113,254, a gain of $57,929, that was due largely to increased shipments from the Wilbert mine near Howe.

Dome district.—One lot of lead ore was shipped from the Great Western claims near Howe, but most of the district output was that of the Wilbert Mining Co. (Ltd.). A 50-ton mill ran on a part-time basis, and 1,000 feet of development work was done. Lead concentrate containing a little silver was shipped to Midvale, Utah.

Hamilton district.—The Badger Mines Co., near Howe, milled a little lead ore and shipped the resulting concentrate to smelters in Utah.

Lava Creek district.—One test lot of silver-lead ore was produced from the Creek property near Martin.

CAMAS COUNTY

Gold Belt district.—A little gold ore was tested by amalgamation, and some was shipped to a smelter from the Yellow Jacket group on Sparrow Creek, a branch of Camp Creek, 4 miles north and 13 miles east of Fairfield.

Little Smoky district (Fairfield).—Two small lots of lead ore were shipped from the Smoky Bullion and Five Points properties, and a test lot of gold ore from the Liberty mine.

Skeleton Creek district.—A 5-ton Gibson mill was installed at the Snowslide mine and a little gold ore treated by amalgamation.

CANYON COUNTY

Snake River district.—A little placer gold was recovered from the banks of Snake River near Melba.

CASSIA COUNTY

Stokes district.—One lot of oxidized lead ore containing considerable gold was shipped from the Big Bertha mine, opened by 1,500 feet of drifts, tunnels, and shafts. One car of high-grade lead ore was shipped from the Independence mine.

CLARK COUNTY

Birch Creek district.—A small lot of silver-lead ore was shipped from the Scott mine, operated by the Idaho Lead Mines Co.

CLEARWATER COUNTY

Moose Creek district.—A little placer gold was recovered at the Dodo Amended property by sluicing. Hydraulic equipment was hauled to the Independence placer.

Pierce district.—Four placers in the Pierce district produced $923 in gold and 11 ounces of silver. In the past the district was a large producer, partly through dredges, but no dredges were at work in 1925.

CUSTER COUNTY

The value of the mine production of metals in Custer County increased from $474,630 in 1924 to $776,995 in 1925, and the mines at Clayton, Mackay, and those in the Boulder district were being

developed actively. The output was more valuable than that any county except Shoshone, and the county retained first place the production of copper. Work done by the Ford Motor Co. developing the Red Bird group at Clayton, and the opening of large body of lead ore in the Livingston mine south of Clayton hav awakened interest in the mines and prospects of the region.

Alder Creek district (*Mackay*).—Seven lode mines in the Alde Creek district produced 30,573 tons of ore yielding $43,614 in gol 49,897 ounces of silver, 2,355,792 pounds of copper, and 325,57 pounds of lead, valued in all at $441,090, or $14.43 a ton. Most the output was copper ore milled by the Idaho Metals Co. Th value of the district output was about double that of 1924, but i was not as large as in some other years. The largest copper pro ducer in Idaho was the Empire mine; it was operated by the Idah Metals Co., which ran a 250-ton flotation mill and shipped coppe concentrate as well as crude ore to International, Utah. The prop erty is opened by a 600-foot shaft, a tunnel 4,000 feet long, and miles of drifts and raises. Much development work was done i 1925, but the amount of ore in reserve is not large, and the mill ra part time.

Several lots of oxidized lead ore were shipped from the Homestak property of the White Knob Mining Co., and similar ore was mar keted from the Blue Bird mine. Silver-lead ore was also mined from the Horseshoe property operated by the Kay Development Co., which was said to have opened up considerable ore early in 1926. Other shipments were made from the Iron Blossom, Speculator, and Doughboy mines.

Bay Horse district.—Six lode mines produced 6,542 tons of ore yielding $557 in gold, 232,422 ounces of silver, 90,083 pounds of copper, and 1,299,476 pounds of lead, valued in all at $287,705, or $43.98 a ton. Nearly all of this ore was concentrated. The Ramshorn mine was the leading producer of the district, although it ceased work September 1. The copper-lead ore was treated in a 50-ton mill, and concentrates rich in silver were hauled 75 miles to Mackay. A few cars of lead concentrate produced by jigging were shipped from the Red Bird property, but the main work was the prospecting campaign carried on by the Ford Motor Co., which controls both the Red Bird and South Butte groups. The company has done nearly 20,000 feet of development, including four tunnels, one of which is more than 2,000 feet long. No details are published regarding the progress of this work, although much low-grade ore is said to be uncovered. Early in 1926 considerable interest was shown in this district by the large operators of northern Idaho. Small shipments were made from the Good Friend, Lucky Thirteen, and Turtle properties.

Boulder district.—The Livingston Mines Corporation shipped several hundred tons of crude lead ore and concentrate and had its concentration-flotation plant running part of the year. The mine, which is opened by seven tunnels, received considerable publicity late in the year, when it was said unusually large bodies of lead ore had been opened. No recent details regarding the extent of the strike have been reported. An article [1] on the mine and its equipment appeared early in 1926.

[1] Mining Truth, Jan. 2, 1926, p. 5.

The Livingston mine, an old property at the head of East Fork, south of Railroad Ridge, 60 miles west of Mackay, was idle for 20 years previous to 1924; then large expenditures were made for road building, mill construction, power plant, and aerial tramway. The mill, however, was not a new, efficient one, and the tramway was poorly constructed. Early in 1925 the output of the mine was small in comparison with the large expenditure for equipment, which included autotrucks for hauling the product to Mackay. Late in the year 40 feet of sulphide lead ore was reported cut in the Livingston vein at a vertical depth of 1,700 feet and 1,300 feet from the portal of the tunnel. The vein contains much high-grade silver-lead ore as well as mill ore, but the presence of considerable antimony in the ore shows that the valuable ore mineral is not all galena, but a mixture of galena with some antimony-lead mineral.

Loon Creek district.—One small lot of copper ore containing considerable gold was shipped from the Lost Packer mine—a large producer in 1908, 1911, and 1913, when a matting furnace was operated.

Sea Foam district.—The Hardscrabble mine produced one lot of rich silver-lead ore.

Yankee Fork district.—Two placers and three lode mines in the Yankee Fork district produced 26 tons of ore, $688 in gold, and 38 ounces of silver. Small test lots of gold ore from the Snow Drift, Pocket, and Ideal properties were treated by amalgamation. A little placer gold was recovered from the Robinson Bar and Rough Creek properties.

ELMORE COUNTY

Dredge operations near Featherville resulted in a large output, mainly gold, but the total value of the metal output for the county was about 37 per cent less than in 1924. Late in the year development work was resumed at the Franklin mine in the Pine Grove district, but the old producing mines at Atlanta were idle.

Bear Creek district.—A little gold bullion resulting from a clean-up at the Vishnu property was sold to the Boise assay office, but virtually all the district output was that of the South Park Dredging Co., which operated its large electric dredge 11 months of the year and handled more than 1,500,000 cubic yards of gravel. This plant, which has a capacity of 5,000 cubic yards of gravel a day, was the second largest producer of gold in Idaho.

Black Warrior district.—A little gold bullion was recovered from ore of the Overlook mine, and placer bullion from Black Warrior Creek, 14 miles from Atlanta.

Middle Boise district.—The old producing mines of this district were idle, but a little bullion was recovered at the Winner or Camp Bird property.

Pine Grove district.—Small lots of bullion were marketed from the Pine Grove district, but no regular milling was done.

Snake River district.—Some unusually fine placer gold was recovered from the banks of Snake River south of Mountain Home.

GEM COUNTY

West View district.—The old producing mines near Pearl remained idle, but a little bullion was recovered from the Bonnell property, as well as placer gold from claims on Willow Creek north of Pearl.

IDAHO COUNTY

The mine production of metals in Idaho County was valu at $33,620 in 1925, a small output compared with that of years ago. The mines of Elk City, Orogrande, Buffalo Hum and Dixie were quiet, and transportation from Stites or Grang ville is still a difficult problem. The geology and ore deposits the region were described at length in a bulletin[2] issued in 1924.

Butts Creek district.—On Butts Creek, a tributary of Salmo River, placer gold was mined by sluicing.

Camp Howard district.—A little placer gold was recovered fro the Klondike placer on Rice Creek near Cottonwood.

Dixie district.—Gold ore from the Monadnock mine was treate in a Huntington mill, and some placer gold was saved from th banks of Salmon River.

Elk City district.—Five placers in the Elk City district produce $854 in gold and 4 ounces of silver, largely from the Golden Rul and Red Horse claims.

Maggie Creek district.—Some placer gold was produced from th Discovery claim on Bridge Creek, 10 miles east of Kooskia.

Marshall Lake district.—A little gold bullion was recovered fron the Alberta mine near Burgdorf, and a little placer gold was marketed from the Phillips claim.

Newsome district.—Placer gold valued at $179 and 1 ounce of silver were recovered mainly from the Moose Creek placer, 9 miles east of Newsome.

Simpson district.—The McKinley mine near Lucile was not worked vigorously, but a few tons of especially rich gold ore were shipped to the Bunker Hill smelter near Kellogg.

Ten Mile district.—One placer and two lode mines in the Ten Mile district produced 156 tons of ore, $2,727 in gold, and 49 ounces of silver, valued together at $2,761. The New York property, with a 5-stamp mill, was operated about two months and gold bullion recovered by amalgamation was shipped to the assay office at Boise. The property has been worked intermittently for several years under trying conditions, as supplies and equipment must be hauled from Stites, a distance of 52 miles. A little gold was recovered from the James E. Paul property, which is equipped with a Lane mill. The Blue Bird placer, 5 miles north of Golden, was worked by hydraulicking.

Warren district.—Three placers and two lode mines in the Warren district produced 1,581 tons of ore, $26,301 in gold, and 737 ounces of silver, valued together at $26,813. The ore yielded metals valued at $19,581, or $12.39 a ton. A 30-ton amalgamation mill was operated by the Unity Gold Mines Co., and considerable gold bullion was shipped to Boise. The ore is not entirely free-milling, and the tailings have been saved for future treatment, possibly by cyanidation. Much placer gold was recovered at the Golden Rule property near Burgdorf, which has been a regular producer since 1911. Gold was also sold from the Buck Diggings on Houston Creek.

[2] Thomson, F. A., and Ballard, S. M., Geology and Gold Resources of North Central Idaho: Idaho Bureau of Mines and Geology, Bull. 7, 1924.

JEROME COUNTY

A little placer gold was taken from the banks of Snake River near Jerome.

LATAH COUNTY

Hoodoo district.—Several cars of sulphide copper ore were shipped from the Mizpah mine, owned by the Merger Mining Co., and a little placer gold was marketed from the Annie claim near Harvard.

LEMHI COUNTY

The value of the mine production of metals in Lemhi County declined $108,778 in 1925, as there was a pronounced decrease in silver, copper, and lead from mines near Salmon and Gilmore. Early in 1926, however, a large deposit of copper ore was opened in the Harmony mine at a depth of 800 feet. A bulletin [3] on the copper deposits of Lemhi County was recently published by the United States Geological Survey.

Carmen Creek district.—One small lot of oxidized lead ore was shipped to Murray, Utah, from the Silver Star claim under lease.

Eldorado district.—The Harmony Mines Co., a large producer of copper ore in 1922 and 1923, made no shipments in 1925, but continued development work, and from the lowest tunnel opened a wide vein of sulphide ore early in 1926.

Eureka district.—One placer and two lode mines in the Eureka district produced 130 tons of ore, $202 in gold, 44 ounces of silver, and 12,891 pounds of copper, valued in all at $2,063. One small lot of gold concentrate was shipped from the Wickham property and copper concentrate from the Tormey mine, but these mines were active only part of the year. Preliminary work was done at the Rocky Mountain placer, 10 miles northwest of Salmon, where the gravel is 12 to 24 feet deep. The Pope Shenon mine, a producer of copper ore, was idle until November, when it was leased to the Idaho Porphyry Copper Mining Co.

Gibbonsville district.—Gold bullion was recovered from ore treated by amalgamation at the Brown Butte mine and from the Gibbonsville group of the American Development & Mining Co.

Indian Creek district (Ulysses).—The Kittie Burton mine at Ulysses, formerly a large producer, marketed a little gold bullion, but regular work has not been done since 1923.

Junction district.—Three lode mines in the Junction district produced 66 tons of ore yielding $11 in gold, 2,257 ounces of silver, 1,612 pounds of copper, and 19,811 pounds of lead, valued in all at $4,098, or $62.09 a ton. Production consisted of first-class lead ore from the Baby Joe group, some copper ore from the Dig More group in Jokes Canyon, 9 miles east of Leadore, and copper ore and lead ore from the Grizzly Hill property, 7 miles north of Leadore. The Leadore Consolidated Mining Co. is said to have much silver-lead mill ore in reserve.

McDevitt district.—Small lots of copper ore were shipped from the Copper Queen mine and from the Fish Can property, 2 miles north of Lemhi.

---

[3] Ross, C. P., The Copper Deposits near Salmon, Idaho: U. S. Geol. Survey Bull. 774, 1925, 44 pp.

Mackinaw district (*Leesburg*).—Six placer mines in the Mackin district produced $2,725 in gold and 10 ounces of silver. Most the gold was recovered by hydraulicking at the Hockensmith pla on Arnett Creek. Considerable equipment was purchased by t Leesburg Gold Placers Co., which was preparing to work 682 ac of placer ground on Napias Creek and its tributaries, near Leesbu At present only experimental work has been done, but the compa plans to treat about 1,000 cubic yards of gravel a day when enou hydraulic equipment has been installed. Gold was also produc by the Cleopatra claim on Wallace Creek, the Golden Gravel pro erty, and various claims on Arnett Creek.

Mineral Hill district.—One small lot of gold ore from the Gru stake claim was treated in a 10-stamp custom mill, and some plac gold was recovered from the claims on Little Horse Creek near Shou

Nicholia district.—Ten cars of oxidized lead ore and one lot of zi ore were shipped from the Viola mine. The property was a lar producer of lead ore in 1886, but recent development work by a less has disclosed much carbonate zinc ore.

Pratt Creek district.—At the Goldstone mine ore was treated in 10-stamp mill equipped for amalgamation and concentration. little bullion was shipped to Boise and one lot of rich gold concentra to Midvale, Utah. The Sandy Creek placer on the west fork Sandy Creek, near Baker, was worked a short time by drift minin

Spring Mountain district.—Four lode mines in the Spring Mou tain district produced 198 tons of ore yielding $235 in gold, 1,25 ounces of silver, 537 pounds of copper, and 84,890 pounds of lea valued in all at $8,564, or $43.25 a ton. Most of the ore—12 tons—was first-class lead ore shipped for smelting. Several cars o carbonate lead ore were shipped from the Excelsior property b lessees, and one lot of silver-lead ore from the Sunnyside mine, miles south of Gilmore, was shipped to Midvale, Utah. Ore fro the Iron Mask mine was concentrated locally and the lead concen trate shipped to Murray, Utah.

Texas district (*Gilmore*).—Three lode mines in the Texas distric produced 11,135 tons of ore yielding $6,691 in gold, 88,170 ounces o silver, 23,934 pounds of copper, and 3,427,540 pounds of lead, valued in all at $369,476, or $33.18 a ton. The output consisted of 6,236 tons of first-class lead ore, and 4,899 tons of mill ore which yielded 259 tons of lead concentrate. The largest production was that of the Pittsburg-Idaho mine operated by the United Idaho Mining Co. About half of the ore was treated in a 40-ton concentration plant and the remainder shipped as first-class ore. The property is opened by 1,010 feet of drifts, tunnels 4,300 feet long, and an inclined shaft 920 feet deep. About 1,000 feet of development work was done in 1925, and shipments averaged about 300 tons a month. A production of more than a million pounds of lead was made from the Latest Out mine. About 2,000 feet of development work was done during the year and the shipments averaged about 200 tons of first-class ore a month. Several hundred tons of lead ore was also shipped from the Gilmore property owned by the Gilmore Mercantile Co.

Unorganized (*Reno*) *district.*—Two lots of oxidized lead ore from the Cabin mine were hauled to Gilmore for shipment to Utah.

OWYHEE COUNTY

The mine production of metals in Owyhee County in 1925 was valued at $21,125, a decrease of $12,747. From 1863 to 1925 the county yielded gold valued at $21,689,248 and 24,589,092 ounces of silver, or a value of $40,658,781 for both metals.

Carson district (Silver City).—Ten lode mines in the Carson district produced 477 tons of ore that yielded $8,312 in gold, 17,999 ounces of silver, and 123 pounds of copper, valued in all at $20,820, or $43.65 a ton. Of this ore 360 tons were concentrated, 105 tons treated by amalgamation, and 12 tons shipped for smelting. Only one lot of rich silver ore containing gold was shipped from the Trade Dollar mine, one of the largest producers of the district in past years. Most of the gold was produced by the Neversweat Mining Co., which operated a 40-ton milling plant equipped with a Marcy rod mill, Wilfley tables, and flotation cells. A little gold and silver ore from the Gold Bug and Dewey properties was also treated by amalgamation and concentration, and bullion and concentrates were shipped from clean-ups of several old mill sites. Steady development work was done at the Great Western property, which has 4,000 feet of tunnels.

French district.—One test lot of rich gold ore was shipped from the Cosmopolitan property. A little bullion was shipped from the Red Jacket group, though the mill was not operated during the year.

Steele district.—The Boulder Creek Mines Co., working property near Triangle, made a small test shipment of gold ore. The mill of the Demming Exploration Co., recently equipped for cyanidation, was idle.

POWER COUNTY

An operator in the vicinity of American Falls saved a little placer gold from the banks of Snake River.

SHOSHONE COUNTY

Mine production of gold, silver, copper, lead, and zinc in the Coeur d'Alene region, Shoshone County, Idaho, in 1925

	Lode mines	Placers	Ore and old tailings	Gold	Silver	Copper	Lead	Zinc	Total value
			Short tons		*Fine ounces*	*Pounds*	*Pounds*	*Pounds*	
25	48	5	[1] 1,714,159	[2] $136,744	[2] 6,701,747	620,444	241,711,973	31,155,037	$28,272,585
crease or decrease from 924	+13	+1	+117,879	−41,073	+5,917	−35,262	+5,057,983	+15,847,420	+3,595,350
tal, 1884–1925			7,059,961	213,944,402	75,428,186	[3] 3,527,990	500,753,986	592,415,477	

[1] Includes 31,767 tons of old tailings milled and 1,560 tons of old tailings sold to a smelter.
[2] Includes placer production of $119,197 in gold and 715 ounces of silver.
[3] Short tons.

The value of the mine production of metals in Shoshone County, which includes the Coeur d'Alene region, was $3,595,350 more in 1925 than in 1924; the gain was due mainly to the increased output and the higher prices of lead and zinc. The average total value of the ore from lode mines in 1925 was $16.42 in recovered metals a ton and the value in gold and silver was $2.72 a ton. The kinds of ore

(largely lead ore and lead-zinc ore with some copper ore and silice ore) and the contents of each kind have been given in preced tables.

Most of the ore, as well as 31,767 tons of old tailings, was mil and produced 255,186 tons of concentrates yielding on the aver $95.68 in metals a ton. Seventeen milling plants, with a combi daily capacity of approximately 7,345 tons, were active during year. All but one of these mills were concentration plants w flotation equipment; four were wholly flotation mills and had tables. Production of silver-lead ore went on profitably at most the large mines, but there was a slight decrease in copper and go The three largest producers of silver and lead in Idaho—the Bunk Hill & Sullivan, Morning, and Hecla mines—are in Shoshone Coun at Kellogg, Morning, and Burke.

The geology and ore deposits of the region were described in bulletin[4] of the Geological Survey issued in 1923. The ann report[5] of the mine inspector lists the operating companies by co ties and gives a detailed bibliography and notes on the progress the active mines. A feature of special interest was the descriptic including flow sheets, of some of the large mills in the Coeur d'Ale region—the Morning, Hecla, Bunker Hill (South mill), Tamarack Custer, Gold Hunter, and Constitution plants.

The mine inspector estimated that 6,000 men were employed Idaho mines in 1925. The average wage for miners was $5.25 day, but in the Coeur d'Alene region wages were higher, ranging fro $5.50 to $6 a day for miners. On November 16 a sliding scale w adopted, which is based on the price of lead.

Beaver district.—The Long Wait Mining Co. worked the Suns group on Sunset Peak and shipped one car of sulphide lead or The mine is opened by a 3,000-foot tunnel and an 800-foot vertic shaft. Placer gold was recovered from the Lock & Irwin and th Poorman placers near Murray. The Callahan Zinc-Lead Co., th largest producer of zinc in Idaho in 1923, was idle. The printe annual report of the company gives the following paragraph regard ing the original property near Sunset, north of Wallace, which i said to have produced 2,265,000 ounces of silver, 118,000,000 pound of lead, and 386,000,000 pounds of zinc:

> At the Callahan mine a small crew has been continuously employed in replac ing timbering to maintain the principal working levels of that property. Th estimated amount of ore still available for extraction in the Callahan mine i approximately 60,000 tons, which, in itself, is not sufficient tonnage to justify the large capital outlay necessary to prepare the mines, buildings, and equip ment there for quantity operations for company account, because the capita expenditure would have to be amortized over so short a period of production a to wipe out possible profits from shipments.

Coeur d'Alene district.—The Yukon Gold Co., which operated its electric dredge near Murray, was the largest producer of gold in Idaho. The plant has a capacity of 5,000 cubic yards a day and handled 1,311,089 cubic yards of gravel from Prichard Creek. The output was valued at $116,461, the cost was $87,390, and the operating profit was $29,071, according to the printed annual report of the company. As nearly all of the dredging ground in the vicinity has

[4] Umpleby, J. B., and Jones, E. L., jr., Geology and Ore Deposits of Shoshone County, Idaho: U. S. Geol. Survey Bull. 732, 1923, 156 pp.

[5] Campbell, Stewart, Twenty-seventh Annual Report of the Mining Industry of Idaho, for 1925.

now been worked, the dredge will soon stop running. Operations began in 1917, and since then the company has produced gold valued at more than $1,100,000.

Eagle district.—Two cars of sulphide lead ore were produced at the Lead Crystals property and hauled to Prichard for shipment to the Bunker Hill smelter. Rich lead ore was being developed by lessees on the Jack Waite mine, which is opened by a tunnel 2,000 feet long and a 600-foot raise.

Evolution district.—Five lode mines in the Evolution district produced 26,483 tons of ore which, with 5,710 tons of old tailings, yielded $88 in gold, 300,695 ounces of silver, 48,326 pounds of copper, and 1,282,212 pounds of lead, valued in all at $327,184, or $10.16 a ton of ore and tailings. The output consisted of 422 tons of crude ore, and 26,061 tons of mill ore which with 5,710 tons of old tailings was reduced to 1,520 tons of lead concentrate.

The largest production of both silver and lead was that of the Yankee Boy mine worked by the Sunshine Mining Co. More than 1,000 tons of lead concentrate containing a relatively large quantity of silver resulted from the operation of a 120-ton flotation plant. About 1,000 feet of development was done during the year, and some rich ore was opened on the 200-foot level, but no estimate was given of the ore in reserve, and exploration on the 400-foot level was not encouraging. Sinking was continued to the 500-foot level, but no drifting was done.

The Western Union Mining Co. shipped several cars of sulphide lead ore and continued to open the property by 1,000 feet of drifting and sinking. Operations were resumed at the Dickens property, and several lots of low-grade lead ore were shipped for experimental purposes. The Silverado group, opened by a long tunnel and a 570-foot inclined shaft, was worked by the Lincoln Mining Co., and several cars of rich silver-lead ore were shipped to East Helena, Mont. A fairly large production of silver-lead concentrate was made at the Sweeny mill from material shipped from the old tailing dam west of Wallace by Harr & Harr. These tailings are reported to contain about 5 per cent of lead and 5 ounces of silver to the ton and operations were said to be profitable. Much development work was done at the Liston and Sterling properties.

Hunter district (Mullan).—Six lode mines in the Hunter district produced 547,138 tons of ore which, with 140 tons of old tailings, yielded $2,019 in gold, 2,007,082 ounces of silver, 156,067 pounds of copper, 74,852,072 pounds of lead, and 18,755,586 pounds of zinc, valued in all at $9,354,651, or $17.09 a ton of ore and tailings. The output of the district increased more than $2,500,000 and consisted of 19,925 tons of first-class ore besides 527,213 tons of mill ore which, with 140 tons of old tailings, was reduced to 85,904 tons of concentrates.

The Morning mine of the Federal Mining & Smelting Co., active throughout the year, was the largest producer of silver and zinc in Idaho and the second largest producer of lead. Lead ore and concentrate were shipped to East Helena, Mont., and lead-zinc concentrate to the electrolytic plant near Great Falls, Mont. The mine is opened by a vertical shaft 2,050 feet below the main adit and 23,100 feet of drifts and tunnels. Reserves are reported to be 1,517,000 tons of developed ore, which averages about 4.3 ounces of silver, 9.5 per cent of lead, and 5.3 per cent of zinc. As the ore comes from the

mine, it is hand-sorted on a belt; the first-class lead ore is shippe for smelting, and the mill feed is treated by concentration an flotation. During the year the mill while in operation was graduall being changed into a differential-flotation plant, equipped wit crushers, Hardinge ball mills, and flotation machines of various type The company controls mines at Gem, Frisco, and Hailey, Idaho Iron Mountain, Mont., and large lead and zinc mines in Kansas Missouri, and Oklahoma. Dividends paid in 1925 amounted t $839,034 from operations in five States, or a total to date of $18,777,546

According to the figures given the county assessor, ore extracte from the Morning mine had a gross value of $7,592,440. The cos of extraction was $2,794,366, freight and treatment $2,399,077 betterments and repairs $129,662; the net profit was $2,269,335. Th Sheridan lease on the upper part of the Morning mine also produce 55,960 tons of ore, valued at $307,774. The cost of extraction wa $294,222 and the net profit $13,552. The printed annual report o the company for 1925 gives the following data:

In the year 1925 your company made the largest earnings in its history, principally due to the following causes: Increased average prices of metals, increased metallurgical recoveries per ton of ore, increased output of ore mined, and favorable operating conditions throughout the year, unaffected by such more or less abnormal conditions as railroad troubles, labor scarcity, strikes, fire, and floods. Not only was the year a favorable one financially, but the developments from the standpoint of ore reserves were also satisfactory, especially in the Morning mine. A year ago the Morning had reached a depth at which many mines in the district had been bottomed. The shaft had just been sunk to the 2,650 level, and the usual crosscut to the vein had been run, but the place where the vein was first met happened to be a lean zone. As the level had not been explored, this poor showing caused some disquietude. Further developments during the year, however, have demonstrated that the lean zone was a strictly local condition, and the 2,650 level, on full development, proved to be the best level in the entire history of the mine. About a month prior to this writing the vein was again struck on the 2,850 level, and while the point of cutting the vein is approximately below that on the 2,650 level, the lean zone has disappeared on the 2,850 level. This level is not yet opened up, but, so far as it has been developed, promises to be quite as good as the 2,650 level.

The earnings of the Morning mine in 1925 amounted to $2,368,621.28, being an increase of $1,237,126.90 over those of the previous year. It was the most profitable year in the history of the mine.

The volume of ore mined was 399,679 tons, the average metal content being 9.5 per cent lead, 4.3 ounces of silver per ton, 5.3 per cent zinc. This includes milling ore mined by leasers and purchased from them.

Ore reserves at the end of the year were estimated at 1,517,000 tons of developed ore and 1,224,000 tons of probable ore; together 2,741,000 tons. This compares with 2,428,372 tons at the end of 1924, and shows an increase of 312,628 tons, although 399,679 tons were mined during the year.

This is due to the fact that the explorations in the upper part of the mine have proved up a considerable tonnage of ore believed to exist there but not heretofore taken into our estimates, and to the fact that we have reached the 2,850 level in the mine, 200 feet lower than a year ago.

We may estimate a further life of eight years on the basis of developed and probable ore to the 3,450 level. The vein on the 2,850 level has not been drifted on; but it has been crosscut at two points, 80 feet apart, and shows ore of greater width and better grade than on the levels above.

From 399,679 tons of ore, including lead-zinc ore milled and first-class lead ore smelted, lead products were made that contained 1,468,042 ounces of silver and 65,688,000 pounds of lead; lead-zinc ore and concentrate were shipped that contained 86 ounces of gold, 167,818 ounces of silver, 2,172,000 pounds of lead, and 18,984,000 pounds of zinc.

The Gold Hunter Mines (Inc.) kept its mine and mill active nearly all the year and shipped silver-lead concentrate to the Bunker Hill smelter at Bradley. The mine, which is opened by 1,500 feet of shafts, 34,100 feet of drifts, 19,686 feet of tunnels, and 6,865 feet of raises, was vigorously developed at depth by 3,504 feet of work in 1925. According to the figures given the county assessor, the company mined 123,135 tons of ore, the concentrate from which had a gross value of $855,885. The cost of extraction was $434,870 and of freight and treatment $307,569; the net profit was $113,446. A 500-ton concentrator, equipped for crushing, grinding, tabling, and flotation, was active 363 days of the year. The mine has been a large and regular producer of silver and lead, especially since 1910, but no details are published regarding development work, production, or dividends.

The Snow Storm mine, which produced more than 50,000,000 pounds of copper from 1904 to 1915, was worked by the Snow Storm Leasing Co. Nearly 1,000 tons of copper ore were shipped to Anaconda, Mont., and Tacoma, Wash. One lot of unusually high grade material assayed nearly 28 per cent of copper and 61 ounces of silver to the ton, but most of the ore shipped late in the year averaged 3 per cent copper and 4 ounces of silver to the ton. Unlike the siliceous oxidized ore shipped before the parent company closed the mine in 1915, all the ore shipped in 1925 was sulphide. Early in 1926 a company was planning to treat this ore in a new flotation plant.

Probably the most interesting development work in the district was that in the Star mine, which is owned by the Sullivan Mining Co. and is opened by a 9,000-foot crosscut from the 2,000-foot level of the Hecla mine at Burke. More than 3,000 feet of development work was done during the year—the larger part of it in ore. The mine became an important producer of both lead and zinc, and the company sold nearly 5,000 tons of concentrates to the Bunker Hill lead plant at Bradley and the zinc smelter at Chenee, Belgium. Contract for the concentrate exported was made with the Vieille Montagne Zinc Co. in May. Lead-zinc ore, which is raised through the Hecla shaft, was treated at the South mill of the Bunker Hill Co. at Kellogg. Metallurgically the problem of treatment is not simple, as the lead and zinc minerals are closely associated, and the sphalerite contains much iron. The annual printed report of the Hecla Mining Co. gives the following paragraph:

> This development has been very satisfactory. We have drifted the whole length of this ore body and made connection with the openings of the Morning mine of the Federal Mining & Smelting Co. This work has been done from the 2,000-foot level of Hecla mine and 4,000 feet below the apex of Star vein. On account of this great depth the work of development for opening the mine for extraction of ore on higher levels involves a large amount of raising and drifting. At present (December, 1925) we are producing about 275 tons daily, all of it from drifts and raises. This ore is sent for concentration to Kellogg, Idaho, to a concentrator belonging to the Bunker Hill & Sullivan Mining and Concentrating Co.

One lot of lead ore was shipped from the Vindicator mine operated by lessees, and one car of lead concentrate was saved from tailings treated by the Stull Leasing Co.

Lelande district (*Burke, Mace, Frisco*).—Nine lode mines in the Lelande district produced 327,491 tons of ore which, with 426 tons of old tailings, yielded $3,588 in gold, 1,929,866 ounces of silver,

138,952 pounds of copper, 64,392,069 pounds of lead, and 147,3 pounds of zinc, valued in all at $6,975,955, or $21.27 a ton of ore a tailings. The district output, which fell off decidedly through t curtailment of work at the Hercules mine at Burke, consisted 24,859 tons of first-class ore, and 302,632 tons of mill ore which wi 426 tons of old tailings was reduced to 46,072 tons of concentrates.

The largest producer of the district was the Hecla mine at Burk which shipped first-class lead ore and concentrate to the Bunke Hill smelter at Bradley. The new surface plant at Burke is equippe for coarse crushing and for sorting the ore on a picking belt. Th mill ore is taken to Gem, where it is treated in a 750-ton plant equippe with jigs, tables, and flotation machines. In December the curren jig tailings from this mill were treated by flotation in a separate plan equipped with Hardinge ball mills and Minerals Separation ma chines. The company paid $2,000,000 in dividends in 1925, or $14, 105,000 to date, was the third largest producer of lead in Idaho, an was second only to the Morning mine in the production of silver

According to the figures given the county assessor, 331,840 tons o ore was extracted, which had a gross value of $5,506,620. The cos of extraction was $1,395,236, freight and treatment $935,905, an betterments and repairs $174,068; the net profit was published a $2,801,411. After paying $2,764,971 for various expenses, including $229,747 for depreciation and depletion, the company paid $270,291 in taxes and $2,000,000 in dividends, leaving a surplus for the year o $494,680, or a surplus to date of $3,322,398. Additional notes from the company's printed annual report follow:

> The year just closed has been characterized by full production and by good prices for the metals produced. The silver price was the highest since purchases by the Federal Government under the Pittman Act were suspended. The average lead price for the year equaled the war-time price.
>
> In the Hecla vein we finished the sinking of the winze to the 2,800-foot level and crosscut to the vein, on which we drifted about 100 feet. This work discloses a very substantial amount of ore.
>
> During the year we constructed a tailings mill for the finer grinding of coarse tailings, and the treatment of the ground material by flotation. This plant was placed in operation in December, will increase the recovery of minerals and, consequently, make some addition to our profits.
>
> Our ore reserves are estimated at 1,506,937 tons. This takes no account of the development below the 2,000-foot level. The amount of work done on these levels has been so small that a tonnage estimate is hardly justified. Work will be resumed in this section of the mine early in 1926.

Of the ore mined, 271,435 tons was milled, making 37,689 tons of concentrate which with 20,758 tons of crude ore was smelted and contained 1,531,793 ounces of silver and 54,775,180 pounds of lead. According to the published reports, the output of the Hecla mine for 22 years was 661,956 tons of crude ore and concentrate containing 18,585,083 ounces of silver, 649,537,776 pounds of lead, and 941,229 pounds of crude zinc.

Several thousand tons of mill ore cleaned up from the Hercules mine in the first three months of the year resulted in a large production of both silver and lead. Nearly 8,000 tons of lead ore and concentrate were shipped to East Helena, Mont. The mine has been a large producer of both silver and lead since 1901, but the ore body was recently worked out 1,200 feet below the No. 5 tunnel. The 800-ton mill at Wallace will be used to treat ore from several properties under the control of the Day interests.

The Ajax Mining Co. at Burke shipped some unusually rich lead ore, as well as milling ore, to one of the Bunker Hill plants near Kellogg. Development work consisted of 600 feet of raises and 300 feet of drifts and about 45,000 tons of crude ore and mill ore has been blocked out.

Considerable lead concentrate from the Ambergris mine was shipped to East Helena, Mont.; the ore was milled at the Hercules mill at Wallace. The mine, which is opened by 13,600 feet of development work and has much silver-lead ore in reserve, was worked throughout the year.

The Mace property of the Federal Mining & Smelting Co. was operated by lessees and silver-lead ore was shipped to East Helena, Mont. According to the figures given the county assessor, 1,263 tons of ore extracted had a gross value of $101,428. The cost of extraction was $88,865, of freight and treatment, $29,366, consequently operations showed a loss.

Lessees worked the Frisco group, also owned by the Federal Mining & Smelting Co., and shipped lead ore and zinc ore. A statement to the county assessor gave 2,056 tons of ore extracted, which had a gross value of $189,144. Cost of extraction was $115,915 and of freight and treatment $53,079, leaving a net profit of $20,150.

Several hundred tons of lead ore were shipped from the Marsh property, where about 900 feet of development work was done through the workings of the Hecla mine. No large ore bodies, however, were discovered.

The remainder of the district output consisted of concentrate from old creek tailings.

Placer Center district (*Sunset*).—Five lode mines in the Placer Center district produced 207,390 tons of ore, which yielded $463 in gold, 387,452 ounces of silver, 65,924 pounds of copper, 15,049,945 pounds of lead, and 5,098,101 pounds of zinc, valued in all at $1,975,517, or $9.53 a ton. The output consisted of 847 tons of first-class lead ore, and 206,543 tons of mill ore which yielded 22,007 tons of concentrates. The total value of the metals recovered decreased more than $420,000 as a result of curtailment at the Success and Tamarack & Custer properties. The 500-ton concentration-flotation plant at Frisco treated ore from the Tamarack & Custer property, and lead concentrate was shipped to East Helena, Mont., and the zinc product to Portland, Oreg., for export to Belgium under a contract made with the Vieille Montagne Zinc Co. late in May. The property is opened by 43,338 feet of tunnels, drifts, and shafts, and nearly 7,000 feet of development, mainly drifting and tunneling, was done in 1925. Connection was made between the No. 6 tunnel and the No. 7, formerly the Mammoth tunnel, and complete mining equipment was installed so that ore from several veins could reach the mill at Frisco by electric haulage. The output of silver and lead was much less than in 1924, but according to the figures given the county assessor the mine produced 17,987 tons of crude ore and concentrate which had a gross value of $1,506,860. The cost of extraction was $73,232, freight and treatment $397,388, and betterments and repairs $125,456; the net profit was $110,784, but no dividends were declared. Another published statement gave a production of 335,000 ounces of silver, 14,200,000 pounds of lead, and 2,720,000 pounds of zinc (gross).

At the Granite mine of the Success Mining Co. much zinc concen trate with some lead concentrate was made at the 250-ton mil Most of the zinc product was shipped to Portland, Oreg., for expo to Belgium, but part of it went to Great Falls, Mont. The Succe mine was once a large producer of zinc, especially from 1907 to 191 but late in 1925 all equipment below the tunnel level was pulled an the mine was allowed to fill with water as the lower levels were cor sidered exhausted.

From the Stratton property north of Wallace several hundre tons of silver-lead ore were shipped to East Helena, Mont., and th company acquired the adjoining Panhandle group. The mine opened by an 80-foot shaft and 1,044 feet of tunnel work. Abou 400 feet of drifting was done in 1925. A clean-up at the Rex propert resulted in the shipment of several cars of lead concentrate, and th Option Mining Co. disposed of two cars of lead ore from the Californi property.

The Callahan Zinc-Lead Co., which owns the Galena mine an other property west of Wallace, gave in its annual report to stock holders the following notes on progress during 1925:

> Development of our Galena property has been vigorously prosecuted durin the past year. * * *. The main ore shoot has been opened to a depth 1,600 feet with commercial ore in varying widths and values on all levels. Th condition of the ore shoot on our lowest level indicates further continuity. Wit the installation of a powerful electric hoist to replace the present inadequat air hoist, the winze will therefore be sunk to greater depths. Approximatel 115,000 tons of milling ore have been developed or partially developed in th Galena mine to date. This justifies the opinion that the property can be place on a production basis during the current year (1926).
>
> In the past fiscal period your company acquired the property of the Wallac Mining & Milling Co., consisting of 400 acres; the holdings of the Silver Rang Mining & Milling Co., consisting of 13 claims containing about 200 acres; an an outstanding half interest in the C. B. X. claim, containing about 10 acres.
>
> Since 1922 we have successively acquired the following contiguous groups Chicago-Boston, Killbuck, Vulcan, Argentine, Wallace and Silver-Range, whic combined with a number of claims acquired by location, consist of 84 claim containing approximately 1,458 acres. * * *
>
> The financial condition of your company is sound, with current assets (con sisting almost wholly of cash and marketable investment bonds) at the end c the fiscal year amounting to $638,256.97. * * *

St. Joe district.—A little placer gold was saved from gravel treate near St. Maries. At the Montana-Idaho and Richmond properties near Adair, some development work was done early in the year after which the mines were closed indefinitely. The Richmon mine produced considerable copper ore from 1916 to 1919.

Summit district.—Five lode mines and one placer in the Summi district produced 313 tons of ore, $3,974 in gold, 867 ounces of silver 218,026 pounds of lead, and 42,075 pounds of zinc, valued in all a $26,742. The ore yielded an average of $81.32 in metals a ton. Witl the exception of 52 tons treated by amalgamation, all the output wa crude smelting ore. The Bear Top mine was worked under leas by the Northwestern Silver & Lead Corporation, which shippe several cars of rich lead ore from Prichard, the terminal of the Murra branch of the Oregon-Washington Railroad & Navigation Co. Th mine is equipped with a 100-ton concentration plant which wa idle in 1925, and the lease was relinquished in December. On car of sulphide lead-zinc ore from the Monarch mine was shipped t Portland, Oreg., for export to Belgium. A 3-stamp mill ran a shor

time on ore from the Mountain Lion property near Murray and the resulting gold bullion was shipped to the assay office at Boise. Some placer gold was recovered from surface material at the Dew Drop property, which is actually a lode mine. Late in the year operations were resumed at the Terrible Edith mine, east of Murray, from which high-grade lead-zinc ore was shipped from 1911 to 1917. At the Giant Ledge property, opened by a 400-foot shaft, additional sinking was planned and a 50-ton flotation mill was being constructed.

Yreka district (Kellogg).—Fifteen lode mines in the Yreka district produced 571,961 tons of ore which, with 27,051 tons of old tailings, yielded $8,690 in gold, 2,074,420 ounces of silver, 211,079 pounds of copper, 85,886,216 pounds of lead, and 7,111,914 pounds of zinc, valued in all at $9,490,916, or $15.84 a ton of ore and tailings. The value of the output, which exceeds that of any other district in the State, increased nearly $2,000,000 but was only slightly more than the value of the Hunter district. The output consisted of 5,310 tons of crude smelting ore, and 566,651 tons of milling ore which with 25,491 tons of old tailings yielded 99,683 tons of concentrates. Other old tailings—1,560 tons—were shipped for smelting.

The Bunker Hill & Sullivan Mining & Concentrating Co. operated its mine at Kellogg, from which there was an increased output, ran three concentration mills, two of which were used partly for custom ore, and directed the operations of several neighboring properties that are under its control. As in 1924, about 7,000 tons of silver-lead concentrate a month were shipped to the Bunker Hill smelter at Bradley and to plants of the American Smelting & Refining Co. at East Helena, Mont., Selby, Calif., and Omaha, Nebr. According to the statement given the county assessor, 453,412 tons of ore were extracted, which yielded concentrates that had a gross value of $7,766,170. The cost of extraction was $1,969,939, freight and treatment $2,326,404, and betterments and repairs $186,932. The net profits, including $79,634 in royalties, were $3,362,529. Dividends aggregated $2,959,210 in 1925, or a total of $33,793,210 paid since 1890. The balance at the end of the year was $9,841,810. The following notes are taken from the company's printed annual report for 1925:

> Because of the larger output of mine run ore and metallic lead during 1925, and the uniformly strong lead market throughout the entire year, a greater operating profit was made than for any former year in the history of the mine.
>
> The Bunker Hill smelter produced more refined lead and silver than during any previous year. The receipts of custom ores were larger, and these continue to grow. The physical condition of the smelting plant is excellent; the expenditures on capital account for improvements, changes, and additions were comparatively small during the year, and no outlays of consequence are planned or necessary during the current year.
>
> Mining for company account has been discontinued in the Stemwinder mine and also in the property of the Sierra Nevada Consolidated Mining Co., but further production in a small way will come from lessee operations.
>
> Crosscutting from the No. 18, the bottom, level of the Bunker Hill mine has disclosed the principal oreshoot which is now being actively developed.
>
> We have blocked out ore to date 53,619 tons in the Sullivan mine and 3,781,795 tons in the Bunker Hill mine.

The ore milled (453,412 tons) was reduced to 77,599 tons of concentrate which contained 48.94 per cent of lead and 17.55 ounces of silver to the ton. The ratio of concentration was 5.84 to 1, and the costs per ton mined were as follows: Mining, $3.62; concentrating,

$0.76; shipping, $0.052; and other costs, $0.359; a total of $4.79. From 1886 to 1925 the company has mined 11,190,594 tons of ore having a gross value of $128,624,265. Net smelter returns have been $78,365,916 and operating profit $44,514,780.

The Bunker Hill smelter and refinery ran continuously in 1925, largely on ore and concentrate from the Bunker Hill and Hecla mines but partly on custom ore from western States, Alaska, and British Columbia. About 5,000 tons of pig lead were sold monthly, as well as refined gold and silver. The equipment includes four large blast furnaces, but only two were in use during the year. A description [6] of the improvements made in 1924, especially the new crushing and sampling plant and additions made at the bag house and Cottrell plants, was published in May. The West mill was busy the entire year on Bunker Hill ore, treating 1,312 tons a day; the South mill, which has a capacity of 430 tons, treated 275 tons of ore a day from the Star, Sidney, and Constitution mines; the Sweeny mill, capacity 250 tons a day, treated 100 tons a day of Bunker Hill lease ore and custom material. Experiments were continued at the testing plant north of the other mills, where silver-lead tailings were treated by the Tainton process.

At the Crescent mine, owned by the Bunker Hill & Sullivan Mining & Concentrating Co., a 75-ton flotation mill that formerly treated Alhambra ore was active throughout the year, and a large output of silver and a fair output of copper were recovered from the resulting concentrates. The mine is opened by 10,000 feet of crosscuts and drifts, and work for the year resulted in a profit of $106,753 before charges were deducted for taxes and depletion. In July the mill ran on a two-shift basis, thereby doubling the mill feed. The Caledonia mine, also under the control of the Bunker Hill Co., produced several thousand tons of stope filling that contained silver, copper, and lead. According to the statement to the county assessor, the mine yielded 3,418 tons of ore which had a gross value of $73,651. The cost of extraction was $28,998, of freight and treatment $26,134, and the net profit was $17,919. No new ore was found, and even the old stope filling is now virtually exhausted. The company has a surplus of $499,465, but past Federal taxes are still unsettled. The mine became productive in 1909 and each year from 1915 to 1917 yielded more than 1,000,000 ounces of silver, as well as copper and lead.

The Constitution Mining & Milling Co., which has property in the Pine Creek region, increased the capacity of its flotation plant from 65 to 150 tons a day. Lead concentrate was shipped to the Bunker Hill plant and the lead-zinc concentrate to the electrolytic plant at Black Eagle, Mont. The main tunnel is nearly 2,000 feet long, and one drift has a length of 1,500 feet. More than 1,200 feet of development work was done in 1925, and the mine is said to have more than 137,000 tons of silver-lead-zinc ore in reserve. There was a marked improvement in both the milling practice and the output.

A large yield of both lead and zinc came from the Nabob Silver-Lead property, from which lead-zinc ore was shipped to the Timber Butte mill, south of Butte, Mont. This custom plant treated ore

[6] Parsons, A. B., "Notes on western lead smelters": Eng. and Min. Jour.-Press, vol. 119, May 30, 1925, p. 882.

from Montana, Idaho, and Washington, making zinc concentrate for roasting and leaching and lead concentrate for smelting. The Nabob company owns no mill, and the ore is hauled 3½ miles to the railroad. In April the company shipped 1,664 tons of milling ore, which contained 3.77 ounces of silver to the ton, 8.69 per cent of lead, and 15.86 per cent of zinc. The debts of the company, which were considerable after the burning of the mill, were reduced to $64,242 in December.

The Sidney Leasing Co. worked the Sidney mine on Pine Creek, and during the last three months of the year shipped lead-zinc ore to the Star mill of the Bunker Hill Co. for separation into lead and zinc concentrates. The company has 150,000 tons of lead-zinc ore of good grade, which is said to be amenable to differential flotation. The output probably will increase greatly as soon as the tramway from Pine Creek to Kellogg, under construction early in 1926, is completed.

After seven years of idleness, the Highland-Surprise mine, which yielded much lead-zinc ore in 1916 and 1917, was retimbered and put in condition for production. The 75-ton mill was completely remodeled and improved to treat the ore by differential flotation. The main haulage tunnel is 2,200 feet long, and the vein is opened by 4,000 feet of drifts on six levels. Ore reserves consist of 40,000 tons of lead-zinc ore. Several hundred tons of lead concentrate were shipped to the Bunker Hill lead plant and more than 2,000 tons of lead-zinc concentrate were shipped to Portland, Oreg., for export to a zinc smelter in Belgium. The 100-ton flotation plant of the Hayes Co., which treats tailings at the mouth of Pine Creek, made a large output of silver-lead concentrate. Operations were resumed at the Hypotheek mine south of Kingston and west of Pine Creek, and some silver-lead ore was treated in the 200-ton concentrator equipped with jigs and tables. Rich carbonate and sulphide lead ore was mined on the 700-foot and 900-foot levels, and the mill was running on a two-shift basis in December. The mine is opened to a depth of 900 feet, and 800 feet of drifts were run during the current year. A little lead-zinc ore from the Douglas mine, which was a rather important producer of lead and zinc in 1917, was shipped to Butte for milling. Production was small from the Sierra Nevada property, which is now worked by lessees, but several hundred tons of lead ore and some siliceous tailings containing lead were shipped to the Bunker Hill smelter. The gross value of the output was reported to be $4,648.

At the Wyoming group, owned by the Federal Mining & Smelting Co., several hundred tons of lead ore were marketed through the operations of lessees. A statement to the county assessor gave 508 tons of ore extracted having a gross value of $35,686, the profit being $3,502. The Amy-Matchless mine on Pine Creek was worked for a short time and several lots of lead concentrate were made in a 75-ton concentration-flotation plant. The Big Creek property was active throughout the year and about 1,000 feet of development work was done, but the 150-ton concentrator ran only a month and the production was comparatively small. The Page mine of the Federal Mining & Smelting Co. was unwatered to develop lead-zinc ore opened by tunnels and a 600-foot inclined shaft.

The Oregon-Washington Railroad & Navigation Co. decided not to extend a branch line up Pine Creek, despite the increased production from the mines of that region. It was therefore planned with the aid of the Bunker Hill Co. to build an aerial tramway 3½ miles long from the Sidney mine to the Bunker Hill mills near Kellogg.

TWIN FALLS COUNTY

Snake River district.—A little placer bullion, valued at $165 in gold, was recovered from the banks of Snake River at the Sandy Bar, Gold Rocket, and Blain Bar placers.

VALLEY COUNTY

Big Creek district.—Sluicing of stream gravel at the Pearl placer near Clover gave a small output of placer gold.

Deadwood Basin district.—A little gold bullion was recovered from the Mary Jane mine, where a 12-inch quartz vein is opened by a 270-foot tunnel, and from the Merry Blue & Union property, formerly a fair producer of gold. The Bunker Hill & Sullivan Mining & Concentrating Co. continued to develop the Hall Interstate and Lost Pilgrim groups under bond, improved the camp, and spent much money for compressor, power plant, and tunnel work. The vein of silver-lead ore was being prospected at a depth of 600 feet by a 1,500-foot adit. The property is 50 miles northeast of Cascade on the Oregon Short Line Railroad.

Lake City district.—Some placer gold was recovered from claims on Secesh and Boulder Creeks, near McCall.

Thunder Mountain district.—The Sunnyside property, an old producer equipped with a 10-stamp amalgamation mill, was worked by lessees, but there was no output until 1926.

WASHINGTON COUNTY

Heath district.—Several hundred tons of gold ore from the Cuddy Mountain property were treated in a 30-ton amalgamation mill. The work of driving a tunnel and sinking a shaft was continued, but the mill ran only one month. The geology of the region was discussed in a pamphlet[7] issued in June.

Snake River district.—Gold valued at $480 and 3 ounces of silver were recovered from placer claims near Snake River, largely from the Sturgill Creek property.

---

[7] Livingston, D. C., Geologic Reconnaissance of Mineral and Cuddy Mountain Mining Districts, Washington and Adams Counties, Idaho: Pamphlet 13, Idaho Bureau of Mines and Geology, 1925.

GOLD, SILVER, COPPER, LEAD, AND ZINC IN WASHINGTON

(MINE REPORT)

By C. N. Gerry

PRODUCTION

SUMMARY

The value of the mine production of gold, silver, copper, lead, and zinc in Washington in 1925 was 15 per cent greater than in 1924, because of the impetus given to mining by the higher prices of silver, copper, lead, and zinc. Decreases in the output of gold and silver were more than offset by increases in copper, lead, and zinc. The total value of the metal output was close to the yearly average of the decade 1916 to 1925, which was about $1,199,500.

A separation of the production by different kinds of ore since 1913 shows that the gold was recovered chiefly from siliceous gold ore, and that the silver came mainly from siliceous ore and copper ore, though of late much of it has come from lead ore. The production of copper was 2,645,022 pounds in 1916, but since that time the annual output has been much less. Considerable lead was produced from 1898 to 1925 and zinc from 1916 to 1925, largely from the Northport region. Since 1860 the metal mines of Washington have yielded gold, silver, copper, lead, and zinc valued at more than $44,000,000, of which 66 per cent represents the value of the gold. Dividends paid by the Gladstone Mountain Mining Co. in 1925 from mining operations in the State amounted to $66,095.

Mine production of gold, silver, copper, lead, and zinc in Washington in 1925

	Number of producers	Ore	Gold [1]	Silver [1]	Copper	Lead	Zinc	Total value
		Short tons		*Fine ounces*	*Pounds*	*Pounds*	*Pounds*	
1925	46	50,287	$230,253	166,425	1,159,057	5,627,241	1,217,846	$1,092,464
Increase or decrease from 1924	+12	+5,904	−79,364	−47,317	+230,599	+1,691,865	+306,956	+143,974
Total, 1860–1925	------	------	29,324,460	8,777,445	20,033,177	54,456,171	10,451,026	44,143,721

[1] Includes placer production.

ORE

The quantity of ore sold or treated in Washington increased 13 per cent, as mining revived in Snohomish, Stevens, and Whatcom Counties. The total average value of the ore rose from $21.35 in recovered metals a ton in 1924 to $21.70 in 1925, but the value in gold and silver declined from $10.19 to $6.85 a ton. Of the total output 39 per cent was copper ore; gold ore, lead ore, and zinc ore followed in order of quantity.

The total and the average recoverable contents of crude ore and concentrates shipped are given on page 556, and the metal recovered from the total ore, both mill ore and crude ore, is shown in the table that follows.

Ore and metals produced in Washington in 1925

Source	Number of producers	Ore		Gold		Silver	
		Short tons	Per cent	Fine ounces	Per cent	Fine ounces	Per cent
Dry gold ore	8	15,376	30.58	10,870.47	97.59	41,646	25.02
Dry silver ore	2	7	.01	5.72	.05	1,437	.86
Copper ore	3	19,500	38.78	139.80	1.26	37,131	22.31
Lead ore	21	11,518	22.90	57.43	.52	77,618	46.64
Zinc ore	3	3,646	7.25	3.50	.03	702	.42
Lead-zinc ore	2	240	.48	8.70	.08	7,880	4.74
Total lode mines		50,287	100.00	11,085.62	99.53	166,414	99.99
Total placers	9			52.87	.47	11	.01
		50,287	100.00	11,138.49	100.00	166,425	100.00

Source	Copper		Lead		Zinc	
	Pounds	Per cent	Pounds	Per cent	Pounds	Per cent
Dry gold ore	4					
Dry silver ore	12					
Copper ore	1,158,812	99.98				
Lead ore	24		5,591,348	99.36		
Zinc ore			5,472	.10	1,128,262	92.64
Lead-zinc ore	205	.02	30,421	.54	89,584	7.36
	1,159,057	100.00	5,627,241	100.00	1,217,846	100.00

The gold ore, as in 1924, was largely siliceous smelting ore mined at Republic and ore treated by amalgamation in Whatcom County. The output from Republic continued to decline as the demand for siliceous ore at Trail, British Columbia, was slight. The total value of metals recovered from gold ore was $253,616, and the average yield of this ore was $14.61 in gold and 2.71 ounces of silver to the ton.

Dry gold ore sold or treated in Washington in 1925, with content in terms of recovered metals

County	Ore	Gold	Silver	Copper
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*
Chelan	1	3.30	1	
Ferry	8,916	6,473.00	41,400	
Kittitas	1	.75		
Okanogan	2	.96	1	4
Whatcom	6,456	4,392.46	244	
	15,376	10,870.47	41,646	4

Two lots of silver ore were shipped from Okanogan County, which yielded on the average $16.86 in gold and 205.29 ounces of silver to the ton.

The metals recovered from copper ore were valued at $193,210. The output came from Lewis, Snohomish, and Stevens Counties and was largely milling ore. Copper ore yielded on the average $0.15 in gold and 1.90 ounces of silver to the ton and 2.97 per cent of copper.

Copper ore sold or treated in Washington in 1925, with content in terms of recovered metals

County	Ore	Gold	Silver	Copper
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*
Lewis	26	0.80	33	2,712
Snohomish	19,119	132.00	13,699	1,086,561
Stevens	355	7.00	23,399	69,539
	19,500	139.80	37,131	1,158,812

The metals recovered from lead ore were valued at $541,504. The output came mainly from Stevens and Pend Oreille Counties; most of it was smelting ore, which contained very little silver, from mines near Northport. Lead ore yielded on the average $0.10 in gold and 6.74 ounces of silver to the ton and 24.27 per cent of lead.

Lead ore sold or treated in Washington in 1925, with content in terms of recovered metals

County	Ore	Gold	Silver	Copper	Lead
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*
Okanogan	1	0.06	40	24	185
Pend Oreille	914		1,043		757,652
Stevens	10,603	57.37	76,535		4,833,511
	11,518	57.43	77,618	24	5,591,348

The metals recovered from zinc ore produced in 1925 were valued at $86,783. Nearly all of the zinc ore was of milling grade; it came from Stevens and Ferry Counties and averaged 15.47 per cent of recoverable zinc before concentration.

The lead-zinc ore—240 tons—yielded on the average 6.34 per cent of lead and 18.66 per cent of zinc.

The following table gives the kind and grade of zinc material shipped in 1925:

Zinc ore and concentrate (as marketed from Washington mines and mills) sold to smelters in 1925

Classification	County	Quantity (dry weight)	Gross zinc	Average assay of ore or concentrate	Recovered zinc
		Short tons	*Pounds*	*Per cent*	*Pounds*
Sulphide zinc ore	Ferry and Stevens	93	63,567	34.18	50,854
Zinc concentrates	Stevens	1,133	1,306,360	57.65	1,166,992
		1,226	1,369,927	55.87	1,217,846

GOLD

The decrease of 26 per cent in the mine production of gold was due chiefly to the comparatively small output from the Republic district, Ferry County. Gold and silver mills yielded 39 per cent of the gold, ores shipped directly to smelters yielded 59 per cent, and concentrates and placers only 2 per cent. Nearly 98 per cent of the gold was recovered from gold ore, largely from Ferry and Whatcom Counties. The chief producers were the Boundary Red Mountain mine in Whatcom County and the Knob Hill and Quilp mines at Republic.

SILVER

The mine production of silver in Washington decreased 22 per cent in quantity. Most of the output came from the Colville and Chewelah districts, Stevens County. The output of Ferry County, which was second, declined greatly. Crude ore shipped to smelters yielded 82 per cent of the silver and concentrates nearly all the remainder. Lead ore yielded 47 per cent of the silver, gold ore 25 per cent, and copper ore 22 per cent. The Old Dominion mine, near Colville, was the largest producer, and the United Silver-Copper mine at Chewelah was second. Other producers of more than 8,000 ounces each were the Quilp, Knob Hill, Sunset, and Santa Rita mines.

COPPER

The mine production of copper in Washington increased 25 per cent in quantity, though it is still below the average for the decade 1916 to 1925. Crude ore was shipped from the Chewelah district, Stevens County, formerly a large producer, but Snohomish County retained first place as a producer of copper and even increased its yield. The Sunset Copper Co., near Index, was the only large producer in the State.

LEAD

The mine production of lead in Washington increased 43 per cent in quantity in 1925 as a result of regular shipments from the Northport region, Stevens County. The Gladstone mine near Northport was the largest producer, as in 1924, and the Electric Point, Grandview, Santa Rita, Bella May, and Old Dominion mines followed in order. The high price of lead stimulated mining in Stevens and Pend Oreille Counties, and the Electric Point mine again produced lead ore after being idle nearly three years.

ZINC

The mine production of zinc in Washington in 1925 increased 34 per cent in quantity. The Black Rock mine, near Northport, was the largest producer; the zinc concentrate was shipped to the electrolytic zinc plant near Great Falls, Mont. Some zinc ore and lead-zinc ore was also mined at the Blue Ridge property near Northport and the Old Dominion mine east of Colville.

MINING AND METALLURGIC INDUSTRY

In 1925 the higher average prices of copper, zinc, silver, and lead (more than a cent a pound for copper and zinc, more than 2 cents an ounce for silver, and nearly a cent a pound for lead) caused some activity in mining in Washington. As a result more copper and more lead were produced than in any year since 1920. The output of gold and silver, however, declined about one-fourth compared with 1924, for the mines at Republic were rather quiet, although considerable development work was done. Unusual interest was shown in the mining and development of lead deposits, and one company operating near Northport became a regular dividend payer. As in other States the problem of separating and saving the lead and zinc in complex ores was being solved, especially for mines in Pend Oreille and Stevens Counties. Ore from the Metaline district, where much activity was shown, will be milled locally or shipped to some custom concentration plant. The most interesting feature in the development of copper deposits was the work of the Royal Development Co., which is opening much low-grade ore near Leavenworth, Chelan County.

Five milling plants in Washington were active in 1925. Of these, four were concentration mills (two used flotation, one table concentration, and one a combination of flotation and table concentration) and one used amalgamation. A revised list of ore-milling plants in Washington and other States for 1925, which gives details of equipment, has been prepared by the Bureau of Mines and may be had on request.

Ore and concentrate from mines in Washington were smelted mainly at Bradley, Idaho, Tacoma, Wash., and Trail, British Columbia. Lead ore and concentrate, formerly treated at Northport, Wash., were smelted at the Bunker Hill plant at Bradley, Idaho; copper material at Tacoma, Wash.; and siliceous ore at Trail, British Columbia. Zinc ore and concentrate was roasted and leached near Great Falls, Mont., and some mixed lead-zinc ore was milled at the Timber Butte custom mill at Butte, Mont. The capacity of the milling, smelting, and refining works at Trail, British Columbia, was increased by additions to the electrolytic zinc plant. The works have units for the treatment of ores containing gold, silver, copper, lead, and zinc, and as they refine all these metals electrolytically in one group of plants they constitute the most complete establishment of the kind in the West. The works were fully described[1] in 1923, but improvements are continually being made.

Nearly 13 per cent of the ore produced in Washington in 1925 (6,458 tons) was treated by amalgamation. The bullion contained gold valued at $90,823 and 244 ounces of silver, or an average of $14.09 in both metals per ton of ore. No quicksilver was purchased nor cyanide used in 1925.

Nearly 51 per cent of the ore was concentrated; it yielded 3,128 tons of concentrates, of which half was copper concentrate. Both the zinc concentrate and the copper concentrate increased slightly, but the lead concentrate was less than in 1924.

[1] Young, G. J., Eng. and Min. Jour.-Press, vol. 116, July 28, 1923, p. 139.

Mine production of metals from Washington concentrates in 1925

BY COUNTIES

	Ore to concentrating mills	Concentrates	Gold	Silver	Copper	Lead	Zinc	Total value of metal
	Short tons	*Short tons*	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*	
Pend Oreille	42	14		33		18,078		$1,596
Snohomish	18,907	1,611	129.00	13,070	1,047,074			160,422
Stevens	6,457	1,503	18.40	16,732	205	268,265	1,166,992	124,051
	25,406	3,128	147.40	29,835	1,047,279	286,343	1,166,992	286,069

BY KINDS OF CONCENTRATES

Copper	1,611	129.00	13,070	1,047,074			$160,422
Lead	384	18.40	15,950	205	284,867		36,262
Zinc	1,133		815		1,476	1,166,992	89,385

AVERAGE RECOVERABLE CONTENT

	Short tons	*Fine ounces per ton*	*Fine ounces per ton*	*Per cent*	*Per cent*	*Per cent*	*Value per ton*
Copper	1,611	0.08	8.11	32.50			$99.58
Lead	384	.05	41.54	.03	37.09		94.43
Zinc	1,133		.72		.07	51.50	78.89
	3,128	.05	9.54	16.74	4.58	18.65	91.45

Nearly 37 per cent of the ore was shipped directly to smelters; most of it came from Ferry and Stevens Counties. Of the shipping ore 48 per cent was dry and siliceous ore and nearly 48 per cent was lead ore. Lead ore increased decidedly but siliceous ore decreased markedly as compared with 1924.

Mine production of metals from Washington crude ore shipped to smelters in 1925

BY COUNTIES

	Ore	Gold	Silver	Copper	Lead	Zinc	Total value of metal
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*	
Chelan	1	3.30	1				$69
Ferry	8,941	6,473.00	41,710		1,485	17,008	164,178
Lewis	26	.80	33	2,712			425
Okanogan	9	6.36	1,478	40	185		1,179
Pend Oreille	872		1,010		739,574		65,044
Snohomish	212	3.00	629	39,487			6,105
Stevens	8,362	58.17	91,474	69,539	4,599,654	33,846	477,302
	18,423	6,544.63	136,335	111,778	5,340,898	50,854	714,302

BY KINDS OF ORE

Dry and siliceous	8,925	6,482.60	42,839	16			$163,739
Copper	593	10.80	24,061	111,738			32,789
Lead	8,812	47.73	68,733	24	5,335,426		512,873
Zinc	93	3.50	702		5,472	50,854	4,901

AVERAGE RECOVERABLE CONTENT

	Short tons	*Fine ounces per ton*	*Fine ounces per ton*	*Per cent*	*Per cen*	*Per cent*	*Value per ton*
Dry and siliceous	8,925	0.73	4.80				$18.35
Copper							
Oxidized	26	.03	1.27	5.22			16.35
Sulphide	567	.02	42.38	9.61			57.08
Lead:							
Oxidized	2,509		.27		22.00		38.46
Sulphide	6,303	.01	10.80		33.57		66.06
Zinc: Sulphide	93	.04	7.55		2.94	27.34	52.70
	18,423	.36	7.40	.30	14.50	.14	38.77

REVIEW BY COUNTIES AND DISTRICTS

Mine production of gold, silver, copper, lead, and zinc in Washington in 1925

County	Ore (short tons)	Gold[1]		Silver[1]	
		Fine ounces	Value	Fine ounces	Value
Chelan	1	3.92	$81	1	$1
Ferry	8,941	6,473.01	133,809	41,710	28,947
Grant		2.52	52	1	1
Kittitas	1	20.75	429	5	3
Lewis	26	.82	17	33	23
Okanogan	10	12.48	258	1,479	1,026
Pend Oreille	914	1.69	35	1,043	724
Pierce		7.55	156	1	1
Snohomish	19,119	146.72	3,033	13,702	9,509
Stevens	14,819	76.58	1,583	108,206	75,095
Whatcom	6,456	4,392.45	90,800	244	169
Total, 1924	50,287	11,138.49	230,253	166,425	115,499
	44,383	14,977.72	309,617	213,742	143,207

County	Copper		Lead		Zinc		Total value
	Pounds	Value	Pounds	Value	Pounds	Value	
Chelan							$82
Ferry			1,485	$129	17,008	$1,292	164,177
Grant							53
Kittitas							432
Lewis	2,712	$385					425
Okanogan	40	6	185	16			1,306
Pend Oreille			757,652	65,916			66,675
Pierce							157
Snohomish	1,086,561	154,292					166,834
Stevens	69,744	9,903	4,867,919	423,509	1,200,838	91,264	601,354
Whatcom							90,969
Total, 1924	1,159,057	164,586	5,627,241	489,570	1,217,846	92,556	1,092,464
	928,458	121,628	3,935,376	314,830	910,890	59,208	948,490

[1] Includes placer production.

Ore sold or treated, lode mines producing, and average value of ore in Washington, 1924–25

County	Ore sold or treated in 1925 (short tons)		Number of lode mines producing		Average total value per ton[1]		Average value per ton in gold and silver[1]	
	Total	Increase or decrease	1924	1925	1924	1925	1924	1925
Chelan	1	+1		1		$69.00		$69.00
Ferry	8,941	−6,939	7	3	$20.67	18.36	$20.65	18.20
Kittitas	1	+1		1		15.00		15.00
Lewis	26	+26		1		16.35		1.54
Okanogan	10	−136	8	5	35.16	118.60	34.01	116.40
Pend Oreille	914	−52	2	8	72.86	72.91	.90	.79
Snohomish	19,119	+4,819	2	1	7.91	8.71	.55	.64
Stevens	14,819	+3,285	10	15	35.73	40.58	7.96	5.17
Whatcom	6,456	+4,899	1	2	12.06	14.09	12.06	14.09
	50,287	+5,904	30	37	21.35	21.70	10.19	6.85

[1] Placer product excluded.

CHELAN COUNTY

The mine production of gold and silver from Chelan County in 1925 was valued at less than $100, but interesting development work was being done by the Royal Development Co. in the Leavenworth district. The company owns 17 claims and is said to have opened an unusually large quantity of low-grade silver-copper ore, which occurs as chalcopyrite and pyrrhotite. The ore zone is to be cut at depth by the Liberty tunnel, which was driven 2,011 feet in 1925.

FERRY COUNTY

Keller district.—No ore was shipped from the Keller district, but development work continued at the Iron Creek and Addison properties, and construction work was done on the road to Wilbur, the shipping point, 35 miles south.

Renner Lake district.—One lot of sulphide zinc ore was shipped from the Renner Lake property, 10 miles southwest of Orient, for export to Belgium.

Republic district.—Two lode mines in the Republic district produced gold and silver valued at $162,541. As in recent years all the ore was shipped to Trail, British Columbia, to be used as a silica flux. From 1896 to the end of 1925 the district produced 620,502 tons of ore, yielding $7,909,248 in gold and 2,334,921 ounces of silver, valued together at $9,387,651. The Last Chance mine, formerly a large producer, was idle, and the property of the Northport Smelting & Refining Co. was being further developed. The Knob Hill and Quilp mines were therefore the only ones from which shipments were made in 1925. Nearly 2,000 feet of development work in drifts, winzes, and shaft work was done by the Balaklala Consolidated Copper Co., which owns the Knob Hill property, and nearly 400 tons of gold ore of good grade were shipped monthly. The Quilp mine, which produced about 350 tons of ore a month, shipped ore containing gold and silver and 89 per cent of silica. The mine was worked to a depth of 950 feet through the shaft of the Surprise mine adjoining. The Golden Eagle mine was unwatered, and development at additional depth was planned by the Hermes Mining Co.

KING COUNTY

The Snoqualmie and Apex mines in the Miller River district were being developed, but no products were marketed in 1925. At the Apex property, where considerable ore containing gold, silver, lead, and arsenic has been developed, some ore was mined and stored for shipment. The property of the Snoqualmie Mining Co. (Inc.) is equipped with a 50-ton flotation plant, and a cyanidation plant was erected in 1925. The mill was started, but the management had difficulty with a flat roaster used to drive off the arsenic.

KITTITAS COUNTY

Swauk district.—Some work at two placers and one lode mine in the Swauk district resulted in the production of $429 in gold and 5 ounces of silver. Preparations for dredging Swauk Creek were made by the Kittitas Gold Mining Co. An electric dredge equipped with 7½-cubic-foot buckets was moved from Baker, Oreg., and erected near Liberty, 20 miles north of Ellensburg; in 1926 it will, no doubt, be an important factor in the gold output of the State.

LEWIS COUNTY

Nisqually district.—One lot of oxidized copper ore was shipped from Ashford by the Eagle Peak Copper Mining Co. Early in 1926 the company installed a 50-ton flotation plant.

OKANOGAN COUNTY

Nespelem district.—One lot of rich silver ore was shipped from the Apache mine, operated by lessees, and a small test lot of oxidized lead ore was mined from the Kankakee group.

Riverside district.—A small test lot of silver ore was shipped from the Silver Bluff mine near Riverside.

Similkameen district.—A little placer gold was marketed from the Slate Rock placer near Oroville.

Squaw Creek district.—The Methow Mining & Smelting Co. worked the Roosevelt mine and continued to drive the tunnel, which was 230 feet long at the end of 1925.

PEND OREILLE COUNTY

The value of the mine production of lead, silver, and gold in Pend Oreille County declined $3,703 in 1925 despite the higher prices for metals. The ore deposits of Newport and Metaline districts were fully described in a bulletin [2] issued in 1924.

Metaline district.—Eight lode mines and one placer in the Metaline district produced 914 tons of ore, $35 in gold, 1,043 ounces of silver, and 757,652 pounds of lead, valued in all at $66,675. The ore yielded an average of $72.91 in metals a ton and was nearly all first-class smelting ore. Several shipments of sulphide lead ore were made from the Bella May property, but the mine was not as active as in 1924. The largest producer of the district was the Grandview mine from which several hundred tons of first-class lead ore were shipped. The lessee was said to have received $34,000 after paying freight and treatment charges. A new 50-ton concentration-flotation mill, installed during 1925, began work early in 1926. Other shipments were made from the K. K., Doherty, Lead King, Josephine, and Cliff mines. A small lot of placer gold was mined from the banks of the Metaline River near Metaline Falls. Lead ore was opened at the Z Canyon property and development work resumed at the Oriole mine.

PIERCE COUNTY

Carbon River district.—A little placer gold was saved from the banks of Carbon River near Spanaway. The American Smelting & Refining Co. operated its large copper smelter and refinery at Tacoma. Most of the ore, concentrate, etc., treated is received by boat from Alaska, South America, and British Columbia, but some came from Chewelah, Index, and other camps in Washington. The plant [3] was fully described early in 1925. The smelter assures a convenient market for the low-grade copper prospects of Chelan and Okanogan Counties when they develop into regular producers.

---

[2] Jenkins, O. P., Lead Deposits of Pend Oreille and Stevens Counties, Washington: Bull. 31, Washington State Department of Conservation and Development, 1924.

[3] Young, G. J., "The Tacoma copper smelter and refinery": Eng. and Min. Jour.-Press., vol. 119, Apr. 4, 1925, p. 557.

SNOHOMISH COUNTY

Darrington district.—About 300 feet of tunnel work was done at the mine of the Jumbo Copper Mining Co., where much ore containing gold, silver, and copper is said to be blocked out.

Index district.—The Sunset Copper Co. operated its 150-ton concentration-flotation plant from March 1 to December 20, except during one month when the water was too low to drive the power plant. Copper concentrate with a little crude copper ore was shipped to Tacoma for smelting. A series of parallel veins is opened by 9,000 feet of drifts and tunnels, and 720 feet of development work was done in 1925. Ore reserves are said to be 200,000 tons of 3 per cent copper ore. As a result of diamond drill work [4] from one of the stopes, two parallel veins were found in addition to a good ore body already stoped. The Sunset vein has produced most of the ore, but there are other veins, including the Harrington, Copper King, Thirty-six, Red Devil, and Discovery, several of which have not yet been explored. The Sunset vein is actually a 40-foot zone containing wide streaks of ore in granodiorite. The conspicuous ore minerals are chalcopyrite and bornite. Extensive improvements to the mining and milling plants will soon be needed.

STEVENS COUNTY

The value of the mine production of metals in Stevens County increased $189,267 in 1925 and was more than half that of the State, though there were decreases in gold, silver, and copper. The ore deposits have been described in detail in a State publication,[5] which gives notes on the history, geology, mineralogy, and development of the large producers of the Northport, Colville, and other districts.

Bossburg district.—One small lot of sulphide lead ore was shipped from the Silver Trail mine. Operations at the Bonanza mine, which is opened by a 700-foot shaft and has much lead ore on the dump, were interrupted by the burning of the 75-ton concentration-flotation plant in June.

Chewelah district.—The United Silver-Copper mine, 6 miles northeast of Chewelah, was in the hands of a receiver in 1925, but several lots of copper ore containing considerable silver were shipped to Tacoma by lessees. The old mill on this property was idle and is considered obsolete. The mine has been a large producer of silver and copper since 1912, and there are hopes of reorganizing the company and developing an adjoining property in 1926.

Colville and Clugsten Creek district.—Other than one lot of lead ore from the Onion Creek property and some test ore from the Neglected group, the entire output of the district was that of the Old Dominion mine, which was a large producer of first-class lead ore containing considerable silver. Three cars of lead-zinc mill ore were shipped as a test to the Sweeny custom plant of the Bunker Hill & Sullivan Mining & Concentrating Co. near Kellogg, Idaho. The mine is opened to a depth of 700 feet by a long tunnel and by several winzes from the adit level. Much prospecting was done on the 700-foot level and new ore was opened by a raise from the 600-foot level. Low-grade ore and fines from the picking belt are saved for future

[4] "Sunset Copper Co. gets real ores": Min. Truth, Oct. 16, 1925, p. 5.
[5] Jenkins, O. P., work cited.

treatment. The Chloride Queen mine north of Colville was being developed, and late in the year machinery for a 50-ton concentration-flotation plant was installed.

Northport district.—Nine lode mines in the Northport district produced 10,834 tons of ore yielding $106 in gold, 3,537 ounces of silver, 205 pounds of copper, 4,435,427 pounds of lead, and 1,163,574 pounds of zinc, valued in all at $476,904, or $44.02 a ton. Of this ore, 7,175 tons were first-class smelting ore and 3,659 tons were milled to make 1,096 tons of concentrates. The largest producer of the district and the largest lead producer of the State was the Gladstone Mountain Mining Co., which shipped lead ore regularly most of the year, continued development of the ore-bearing chimneys, and paid dividends amounting to $66,095. According to the annual printed report, the company shipped 1,513 tons of sulphide lead ore with an average lead content of 74.02 per cent, and 2,508 tons of carbonate ore with an average lead content of 22.87 per cent, for which the smelter paid $199,805. No estimate of ore reserves was published, but development work amounting to 1,000 feet was done. The company's report says:

> Developments in the old workings have proved especially satisfactory in the No. 10 chimney. The bulk of the shipments have gone forward from this chimney of late. A winze was recently sunk from the 300-foot level on the No. 8 to a depth of 25 feet in good ore.
>
> Developments in other portions of the mine are proving satisfactory, with every indication of producing large tonnage in the future.
>
> The new find, which is 1,000 feet from the present workings, is being developed by shaft, and results here will be a factor in determining whether or not shipments will be materially increased this year and a consequent increase in the regular dividend inaugurated.

Nearly 3,000 tons of lead ore were shipped from the Electric Point property, but it was largely low-grade material from former operations and the mine was not worked vigorously. From 1916 to 1920 the mine was a large producer of lead, as is stated in an article[6] that summarizes the history and production and gives notes on the odd replacement deposits in magnesian limestone. Records for four years from 1917 to 1920 showed an output of 38,623 tons of ore, valued at $1,131,949. Operating cost was $676,669; profit, $445,279. The Blue Ridge Mining Co., a new producer of zinc, shipped several lots of sulphide zinc ore to electrolytic leaching plants and a little lead-zinc ore to a custom mill at Butte, Mont. Production and development continued at the Black Rock mine, worked by lessees. Several thousand tons of zinc ore were treated in a small concentration plant; the product was shipped to the electrolytic zinc plant near Great Falls, Mont., after being hauled 6 miles by truck to Northport. The shaft is down 800 feet. The minerals are smithsonite and sphalerite, unusually free from galena, and the ore, like that of the Gladstone mine, occurs in blue magnesian limestone. An account of the history[7] of the mine and the equipment of the mill was published in June. Other small shipments were made from the Lead Trust, Great Western, Silver Crown, Bullion, and W. J. Bryan properties. Development work was being done at the Keystone property, which comprises 12 claims near the Gladstone mine.

[6] Howard, L. O., "Northport interesting to geologists": Min. Truth, May 16, 1925, p. 7.
[7] Howard, L. O., "Black Rock mine worth more prospecting": Min. Truth, June 1, 1925, p. 7.

Springdale district.—The entire output of the Springdale district was that of the Cleveland mine, worked by the Santa Rita Mining Co. The mine was active from January to June and several hundred tons of lead concentrate were marketed as a result of the operation of a 50-ton flotation plant. The concentrate is hauled 18 miles southeast to Cline, near Springdale, on the Great Northern Railroad. The Venus Silver Mines Co. in the same region operated the Deer Trail, Providence, and Elephant properties, large producers from 1898 to 1902. Reserves are reported to be 250,000 tons of ore averaging about 16 ounces of silver to the ton besides a little gold and lead. It is planned to complete and add flotation cells to the 100-ton mill in 1926. The Togo mine, being developed by the Consolidated Copper Co., has in reserve several thousand tons of copper ore.

Summit district.—The Consolidated Silver Mountain Mines Co. continued its tests of the Daisy mine ore, which contains silver, lead, zinc, arsenic, and iron. The property is equipped with a 75-ton mill, a sublimation furnace, and bag house. Plans include roasting the sulphide concentrate at a high temperature, saving the valuable metals, and eliminating the iron and insoluble.

Valley district.—At the Admiral mine, 9 miles west of Valley, a large quantity of low-grade copper ore containing gold and silver was exposed by the 850 feet of tunnel and shaft work done during the year. A new company was developing the Nevada mine, said to have a good showing of lead-zinc ore.

WHATCOM COUNTY

Mount Baker district.—The largest producer of gold in Washington was the Boundary Red Mountain mine, 30 miles south of Sardis, British Columbia. Its ore was treated in a 10-stamp mill equipped with amalgamation plates and a Johnston rod mill. After being crushed by stamps the ore goes through 20-mesh screens and over plates; the coarse sands from the drag classifier are then run through the rod mill and over plates. The gold is associated with pyrite, chalcopyrite, and bismuth telluride. The Lone Jack mine, a producer of gold in 1924, was deeded to the Brooks-Willis Metals (Inc.), which has a 75-ton amalgamation mill, and reports 500,000 tons of $12 gold ore in reserve.

Slate Creek district.—The Slate Creek property was idle, but a hydroelectric power plant was planned for the Azurite mine, where much gold ore is exposed.

GOLD, SILVER, COPPER, LEAD, AND ZINC IN ARIZONA

(MINE REPORT)

By V. C. Heikes

PRODUCTION

In 1925 the mines of Arizona produced gold, silver, copper, lead, and zinc valued at $113,138,198. Compared with that of 1924 the value of the output increased $13,527,819, or 14 per cent, because of the large increase in the output of copper. The New Cornelia, Miami Copper, Calumet & Arizona, United Verde Extension, United Verde, Inspiration, Magma, Arizona Commercial, and Midland mining companies paid dividends amounting to $11,587,220. The Phelps Dodge Corporation, operating mines at Bisbee and Morenci, Ariz., and also in Mexico and New Mexico, paid $2,000,000, which is not included in the total given above.

The quantity and value of all metals except gold increased, and the decrease in gold was due to the closing of the Gold Road and United Eastern properties in Mohave County. The average value of the metals recovered from the ore, old tailings, slag, etc., increased from $5.03 a ton in 1924 to $5.41 in 1925, and the value in gold and silver decreased from 47 cents to 44 cents a ton.

Mine production of gold, silver, copper, lead, and zinc in Arizona in 1925

	Number of producers	Ore, slag, tailings, etc	Gold[1]	Silver[1]	Copper	Lead	Zinc	Total value
		Short tons		*Fine ounces*	*Pounds*	*Pounds*	*Pounds*	
1925	386	20,927,382	$4,170,355	7,257,868	713,355,129	23,876,017	7,332,116	$113,138,198
Increase or decrease from 1924	+111	+1,106,877	−708,110	+608,592	+35,603,116	+5,233,703	+7,332,116	+13,527,819

[1] Includes placer production.

ORE

Copper ore led in quantity the ores mined in Arizona in 1925; lead ore and dry and siliceous gold ores followed. The total values of the metals recovered from the ores, old tailings, slag, etc., were as follows: Dry gold ore, $758,861; dry gold and silver ore, $23,456; dry silver ore, $466,941; copper ore, $108,207,946; lead ore, $2,546,901; zinc ore $21,000; copper-lead ore, $340,647; and lead-zinc ore, $768,162. In addition, the placers produced gold and silver valued at $4,284. Thus the State total was $113,138,198.

Ore and metals produced in Arizona in 1925

Source	Number of producers	Ore, tailings, slag, etc.		Gold		Silver	
		Short tons	Per cent	Fine ounces	Per cent	Fine ounces	Per cent
Dry gold ore	77	[1] 71,289	0.34	33,644.79	16.68	60,065	0.83
Dry gold and silver ore	10	2,036	.01	432.77	.22	14,630	.20
Dry silver ore	38	[2] 51,665	.25	2,886.27	1.43	431,032	5.94
Copper ore	88	[3] 20,634,428	98.60	[5] 153,349.54	76.01	[5] 5,795,173	79.85
Lead ore	162	[4] 127,944	.61	7,807.84	3.87	803,153	11.06
Zinc ore	3	305	----------	1.00	----------	1,389	.02
Copper-lead ore	6	24,565	.12	3,264.49	1.62	144,567	1.99
Lead-zinc ore	7	15,150	.07	147.80	.07	7,835	.11
Total lode mines	----------	20,927,382	100.00	201,534.50	99.90	7,257,844	100.00
Total placers	18	----------	----------	206.42	.10	24	----------
	----------	20,927,382	----------	201,740.92	100.00	7,257,868	100.00

Source	Copper		Lead		Zinc	
	Pounds	Per cent	Pounds	Per cent	Pounds	Per cent
Dry gold ore	149,982	0.02	4,340	0.02	----------	----------
Dry gold and silver ore	28,969	.01	2,799	.01	----------	----------
Dry silver ore	72,460	.01	1,124,724	4.71	----------	----------
Copper ore	[5] 711,380,756	99.72	151	----------	----------	----------
Lead ore	877,474	.12	19,580,573	82.01	----------	----------
Zinc ore	7,556	----------	7,359	.03	240,808	3.28
Copper-lead ore	833,163	.12	626,720	2.63	----------	----------
Lead-zinc ore	4,769	----------	2,529,351	10.59	7,091,308	96.72
	713,355,129	100.00	23,876,017	100.00	7,332,116	100.00

[1] Includes 21,485 tons of old tailings.
[2] Includes 2,816 tons of old tailings.
[3] Includes 5,957 tons of matte, 61 tons of smelter cleanings, and 1,039,512 tons of ore leached.
[4] Includes 10,311 tons of old tailings and 5,777 tons of slag.
[5] Includes 0.14 ounce of gold, 40 ounces of silver, and 1,114,770 pounds of copper recovered from precipitates.

GOLD ORE

Gold ore and old tailings, which represented less than one-half of 1 per cent of the total output of ore, tailings, etc., were reported by 77 producers in 1925, 12 more than in 1924. The ore and tailings yielded on the average $9.76 in gold and 0.84 ounce of silver to the ton, with a little copper and lead, and had a value of $10.64 in metals a ton. Mohave County, with 20 producers, reported the largest output of gold ore, followed by Maricopa County, with 6 producers, and Yavapai County with 29 producers.

Dry gold ore and tailings sold or treated in Arizona in 1925, with content in terms of recovered metals

County	Ore and tailings	Gold	Silver	Copper	Lead
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*
Cochise	2,226	1,507.37	17,613	27,594	198
Gila	18	18.14	7	----------	----------
Maricopa	[1] 14,830	1,003.38	1,471	1,867	----------
Mohave	45,505	28,246.76	20,094	2,524	4,127
Pima	352	242.94	1,082	1,459	----------
Pinal	212	142.08	61	301	----------
Yavapai	[2] 7,645	2,261.86	19,718	116,188	15
Yuma	501	222.26	19	49	----------
	71,289	33,644.79	60,065	149,982	4,340

[1] Includes 14,650 tons of old tailings.
[2] Includes 6,835 tons of old tailings.

GOLD AND SILVER ORE

Ten producers in five counties reported a production of gold-silver ore. This ore yielded on the average $4.39 in gold and 7.19 ounces of silver to the ton, with a little copper and lead, and had a value of $11.52 in metals a ton.

Dry gold and silver ore sold or treated in Arizona in 1925, with content in terms of recovered metals

County	Ore	Gold	Silver	Copper	Lead
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*
Cochise	184	44.50	1,174	1,001	----------
Graham	4	5.80	286	----------	----------
Mohave	92	56.11	1,492	49	2,799
Pima	14	4.76	209	----------	----------
Yavapai	1,742	321.60	11,469	27,919	----------
	2,036	432.77	14,630	28,969	2,799

SILVER ORE

A total of 38 producers in 8 counties reported the output of silver ore and tailings. The largest quantity came from a producer in Mohave County, near Signal. The silver ore and tailings yielded on the average $1.15 in gold and 8.34 ounces of silver to the ton, with a little copper and lead, and was valued at $9.04 in metals a ton.

Dry silver ore and tailings sold or treated in Arizona in 1925, with content in terms of recovered metals

County	Ore and tailings	Gold	Silver	Copper	Lead
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*
Cochise	[1] 23,055	2,638.61	245,593	46,560	9,039
Gila	44	.10	2,431	----------	----------
Greenlee	192	8.20	1,833	884	86
Mohave	26,153	205.36	131,693	18,190	1,110,958
Pima	17	.13	1,217	510	841
Pinal	[2] 2,110	30.30	43,329	5,225	----------
Yavapai	29	2.92	796	1,091	----------
Yuma	65	.65	4,140	----------	3,800
	51,665	2,886.27	431,032	72,460	1,124,724

[1] Includes 2,655 tons of old tailings sold to a smelter.
[2] Includes 161 tons of old tailings sold to a smelter.

COPPER ORE

Of the copper ore mined by 88 producers in Arizona, 17,120,614 tons came from six low-grade disseminated deposits worked by five companies, whose mines are near Globe, Ray, Ajo, Bisbee, and Morenci. The richer siliceous ore, or that valuable as converter lining, was shipped to the smelters. The crude copper ore mined and smelted directly (without concentration) amounted to 2,865,743 tons. The total copper ore, matte, etc., sold or treated in 1925 yielded on the average 15 cents in gold and 0.28 ounce of silver to the ton and 1.72 per cent of copper, and was valued at $5.24 in metals a ton, compared with $4.86 in 1924.

Copper ore, matte, etc., sold or treated in Arizona in 1925, with content in terms recovered metals

County	Ore, matte, etc.	Gold	Silver	Copper	Lead
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pound*
Cochise	2,436,397	56,354.34	1,369,502	145,596,846	
Gila	[1]8,511,388	8,942.33	622,610	175,608,349	
Greenlee	[2]1,528,217	3,919.29	139,611	59,463,531	
Maricopa	15	.80	8	2,857	
Mohave	22	1.01	26	4,061	
Pima	[3]3,365,031	14,367.02	254,564	74,762,898	
Pinal	3,283,078	10,439.46	829,449	102,823,025	
Santa Cruz	88	6.70	1,030	7,479	1
Yavapai	1,509,653	59,153.63	2,577,464	153,045,267	
Yuma	539	164.96	909	66,443	
	20,634,428	[4]153,349.54	[4]5,795,173	[4]711,380,756	1

[1] Includes 344 tons of ore leached and 5,957 tons of matte.
[2] Includes 61 tons of old smelter cleanings.
[3] Includes 1,039,168 tons of ore leached.
[4] Includes 0.14 ounce of gold, 40 ounces of silver, and 1,114,770 pounds of copper recovered from precip tates.

LEAD ORE

The output of lead ore, old tailings, and slag was reported from 1 counties by 162 producers; the average yield was $1.26 in gold an 6.28 ounces of silver to the ton, 7.65 per cent of lead, and a littl copper, and was valued at $19.91 in metals a ton. Ninety-two pe cent of the ore, tailings, and slag came from 23 properties in Cochis County, and most of it was from mines near Bisbee, in the Warrer district. Thirty-three producers in Santa Cruz County reporte 3,454 tons of lead ore and old tailings, 26 producers in Pima County reported 2,127 tons of ore, 23 producers in Mohave County reporte 1,349 tons, and 15 producers in Yavapai County reported 1,039 tons

Lead ore, slag, and tailings sold or treated in Arizona in 1925, with content in terms of recovered metals

County	Ore, slag, and tailings	Gold	Silver	Copper	Lead
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*
Cochise	[1]117,981	6,897.47	682,156	796,391	16,346,563
Gila	580	29.50	1,713	3,619	158,019
Graham	157		131	191	41,740
Greenlee	22		115	656	4,721
Maricopa	98	27.00	478	1,296	51,000
Mohave	1,349	446.42	26,370	7,681	342,040
Pima	2,127	102.84	15,808	18,149	893,013
Pinal	595	53.38	2,151	4,797	262,621
Santa Cruz	[2]3,454	58.81	45,268	30,187	1,015,397
Yavapai	1,039	175.96	24,656	13,322	197,992
Yuma	542	16.46	4,307	1,185	267,467
	127,944	7,807.84	803,153	877,474	19,580,573

[1] Includes 5,777 tons of slag sold to a smelter and 9,515 tons of old tailings concentrated.
[2] Includes 796 tons of old tailings sold to a smelter.

ZINC ORE

Three producers in Cochise, Pima, and Yavapai Counties reported the output of 305 tons of sulphide zinc ore, valued at $68.85 in metals a ton.

COPPER-LEAD ORE

Six producers in five counties reported the output of 24,565 tons of copper-lead ore, nearly all of which came from Yavapai County. This ore yielded on the average $2.75 in gold and 5.89 ounces of silver to the ton, 1.70 per cent of copper, and 1.28 per cent of lead, and was valued at $13.87 in metals a ton.

Copper-lead ore sold or treated in Arizona in 1925, with content in terms of recovered metals

County	Ore	Gold	Silver	Copper	Lead
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*
Gila	12	----------	1,864	931	1,393
Pima	4	1.30	66	370	3,203
Pinal	352	24.50	15,332	24,974	311,925
Santa Cruz	14	----------	174	891	2,664
Yavapai	24,183	3,238.69	127,131	805,997	307,535
	24,565	3,264.49	144,567	833,163	626,720

LEAD-ZINC ORE

Lead-zinc ore (15,150 tons) was reported by seven producers in Cochise, Gila, Mohave, and Santa Cruz Counties. This ore yielded on the average $50.70 in metals a ton.

Lead-zinc ore sold or treated in Arizona in 1925, with content in terms of recovered metals

County	Ore	Gold	Silver	Copper	Lead	Zinc
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*
Cochise	13,985	----------	----------	----------	2,349,480	6,712,800
Gila	520	----------	----------	----------	104,160	189,440
Mohave	615	147.80	7,712	4,546	72,332	174,703
Santa Cruz	30	----------	123	223	3,379	14,365
	15,150	147.80	7,835	4,769	2,529,351	7,091,308

The following table shows the zinc ore, lead-zinc ore, and concentrates produced in 1925; also the average zinc content (assay) and recovered zinc:

Zinc ore, lead-zinc ore, and concentrates (as marketed from Arizona mines and mills) sold to smelters in 1925

Classification	County	Quantity (dry weight)	Gross zinc	Average assay of ore or concentrates	Recovered zinc
		Short tons	*Pounds*	*Per cent*	*Pounds*
Sulphide zinc ore	Cochise, Pima, and Yavapai	305	283,300	46.44	240,808
Oxidized lead-zinc ore	Gila	520	236,800	22.77	189,440
Sulphide lead-zinc ore	Cochise and Santa Cruz	14,015	8,407,900	30.00	6,727,165
Zinc concentrates	Mohave	177	209,943	59.31	174,703
		15,017	9,137,943	30.43	7,332,116

GOLD

Of the total mine production of gold, 14.5 per cent was recovered from ore and old tailings treated in gold and silver mills and 62 per cent was gold from crude ore shipped to smelters. Ores treated in mills by amalgamation yielded gold valued at $17,366, and ores and old tailings treated by cyanidation, $589,389. Concentrates yielded gold valued at $945,582, against $703,403 in 1924, and ores shipped directly to smelters yielded $2,580,189, against $2,486,542 in 1924. The chief gold-producing districts were the Warren district, Cochise County, and the Verde district, Yavapai County, both of which produced copper ores, and the San Francisco district, Mohave County, which yielded siliceous gold ores.

Of the mines yielding gold, the United Verde Copper Co. reported the largest output; the Copper Queen, at Bisbee, was second. The Calumet & Arizona, at Bisbee, the Tom Reed, at Oatman, the New Cornelia, at Ajo, the Magma, at Superior, and the United Verde Extension, at Jerome, were the next largest producers of gold.

SILVER

The largest gain in silver was reported in Yavapai County and the largest decline in Cochise County. Bullion from gold and silver ores and old tailings contained 22,378 ounces of silver recovered by cyanidation and 494 ounces recovered by amalgamation. Concentrates yielded 23 per cent of the total output of silver and crude ore shipped to smelters 76 per cent.

Of the total silver 66.5 per cent came from the ore of the United Verde, Copper Queen, Magma, Calumet & Arizona, and United Verde Extension, each of which produced more than 400,000 ounces. The other mines yielding more than 150,000 ounces of silver each were the Shattuck, New Cornelia, Bunker Hill, Iron Cap, Old Dominion, and Superior & Boston.

COPPER

The mine production of copper in 1925 was 713,355,129 pounds, 5 per cent more than in 1924, and has been exceeded in only two years—1918 and 1916—when 765,000,000 and 722,000,000 pounds, respectively, were recorded. The market price of copper at New York was quoted by the Engineering and Mining Journal-Press at 14.709 cents a pound in January, decreased to 13.252 cents in April, increased until August, when it was 14.490 cents a pound, near which it remained until December, closing at 13.85 cents. The average quoted price for the year was 14.042 cents, but the average sales price used in this report is 14.2 cents. Of the total copper produced in the State in 1925, 56 per cent was obtained from concentrates, 41 per cent from crude ore smelted, and 3 per cent from ore leached, etc. Of the output from crude ore smelted, Yavapai County yielded 51 per cent and Cochise County 37 per cent. The copper from ore milled came mainly from Gila and Pinal Counties. The low-grade disseminated ores in Cochise, Pima, Pinal, and Gila Counties yielded 310,953,547 pounds of copper, compared with 321,458,562 pounds in 1924. Similar low-grade copper deposits were worked in Greenlee County, so that the total production from the disseminated deposits in Arizona was 363,959,478 pounds. In 1924 these ores altogether produced 355,858,614 pounds of copper.

Nine properties, each yielding more than 39,000,000 pounds, produced 88 per cent of the total quantity of copper. The United Verde was first, followed by the Copper Queen, Inspiration, Ray Consolidated, New Cornelia, Phelps Dodge property at Morenci, Miami, United Verde Extension, and Calumet & Arizona mines. Other mines that produced more than 1,000,000 pounds of copper each were the Magma, Old Dominion, Arizona Commercial, Iron Cap, El Tiro, Night Hawk, Midland, Shattuck, and Superior & Boston.

LEAD AND ZINC

The largest yield of lead was in silver-lead ore from the Copper Queen and Shattuck mines, at Bisbee, in lead-zinc ore from the Calumet & Arizona mine, also at Bisbee, and in lead ore from the Hilltop mine, at Hilltop, all in Cochise County. These four properties yielded 63 per cent of the total lead output. Other large producers of lead were the Signal mine, in Mohave County, and the Mystery mine and Grand Central tailing dump, both in Cochise County.

Nearly all the zinc in 1925 came from the Calumet & Arizona property. Other producers were the New Dominion, Arizona Hillside, and Arizona Premier mines. No zinc was produced in Arizona in 1924.

MINING AND METALLURGIC INDUSTRY

The mine production of copper, silver, and lead compared favorably with that of the war period, though prices of metals, except of lead, were lower and the output of gold, especially from Oatman, was decidedly less. Arizona retained its place as the leading copper producer of the United States and made an output close to that of 1918 despite the fact that market conditions did not warrant a record output. Recent advances in milling which facilitate the separation of lead and zinc minerals have provided marketable products from the complex lead-zinc ores in which zinc was formerly a detriment rather than an asset. The demand for lead and zinc has aroused much interest in mines and prospects in Arizona, and during 1925 considerable prospecting was done in various districts. According to the report of the mine inspector, 125 operating mines in the State employed 13,985 men in 1925. Of this number 4,147 were surface workers and 9,838 worked underground.

Eight smelting plants within the State, all treating copper ores, were active throughout the year, and considerable ore was also treated at El Paso, Tex. The Old Dominion smelter was closed in December, 1924, but the mine output was treated at the International plant at Miami. Though the price of copper was not high and there was some talk of curtailment, several of the large properties, such as the United Verde, Copper Queen, Ray Consolidated, Calumet & Arizona, and Morenci mines, decidedly increased their output. The smelter at Humboldt was idle, but much ore and concentrate was purchased by the Southwest Metals Co. in anticipation of active operations.

Forty-four milling plants in Arizona were active in 1925. Twenty-five were concentration plants, of which 14 used tables and flotation devices, 5 used flotation alone, and 6 used jigs and tables without flotation cells. Eleven mills were equipped for amalgamation, 5 for

cyanidation, 1 for amalgamation and concentration, 1 for amalgam tion and cyanidation, and 1 for leaching. The leaching of ore dum was continued near Bisbee and Jerome, but at the Arizona-Bagda property in Yavapai County leaching of ore "in place" was still i the experimental stage. No copper was produced from leachin roasted pyrite "in place" at the Copper Belle mine, near Gleeson, i Cochise County. Near Bisbee the Shattuck Denn Mining Corp ration resumed the milling of a carbonate lead ore but changed th flow sheet, sulphidizing the lead mineral and using flotation alon At Inspiration a 7,500-ton leaching plant was under construction t treat mixed oxidized and sulphide ores.

A marked decrease (65 per cent) was shown in the gold saved b cyanidation, due chiefly to the closing of the United Eastern an Gold Road mines in Mohave County.

A revised list of milling plants in Arizona for 1925, giving detail of equipment, has been prepared by the Bureau of Mines as a sepa rate pamphlet, which may be had on request.

Gold and silver produced at mills in Arizona in 1925

County	Ore (short tons)	Bullion (fine ounces) recovered by—				Total value
		Amalgamation		Cyanidation		
		Gold	Silver	Gold	Silver	
Cochise	131	2.97	1	3.58	930	$78
Gila	36	18.14	7	----------	400	65
Maricopa	10	9.52	2	[1] 818.07	[1] 1,350	18,04
Mohave	45,143	59.59	30	27,636.90	19,283	585,94
Pima	[2] 324	212.44	292	4.76	209	4,83
Pinal	180	133.08	57	----------	----------	2,79
Yavapai	352	201.50	90	[3] 48.37	[1] 206	5,37
Yuma	484	202.86	15	----------	----------	4,20
	46,660	840.10	494	28,511.68	22,378	622,62

[1] Includes bullion from 14,650 tons of old tailings.
[2] Also yielded 4 tons of siliceous concentrate.
[3] Includes bullion from 20 tons of old tailings.

Concentration reduced 16,821,081 tons of ore and old tailings to 1,042,186 tons of concentrates, and gold and silver mills produced 4 tons of concentrates.

Mine production of metals from Arizona concentrates in 1925

BY COUNTIES

	Ore to concentrating mills	Concentrates	Gold	Silver	Copper	Lead	Zinc	Total value of metal
	Short tons	*Short tons*	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*	
Cochise	[1] 1,337,432	[2] 225,272	8,372.46	231,003	34,450,808	3,698,736	----------	$5,547,195
Gila	8,414,911	309,323	8,215.56	313,739	165,626,303	6,677	----------	23,907,082
Graham	104	13	----------	40	54	8,814	----------	803
Greenlee	1,486,896	124,636	3,400.27	115,648	53,005,931	----------	----------	7,677,392
Mohave	25,475	1,499	177.83	109,463	6,916	1,161,002	174,703	194,910
Pima	2,284,175	84,498	14,371.60	210,857	51,977,126	14,520	----------	7,825,438
Pinal	3,221,603	286,790	7,720.08	541,364	90,680,585	20,530	----------	13,413,724
Santa Cruz	227	34	1.56	1,404	586	35,228	----------	4,154
Yavapai	[3] 40,035	[4] 9,987	3,483.05	149,656	1,525,989	358,404	----------	423,733
Yuma	408	138	.09	2,793	----------	167,351	----------	16,500
	16,811,266	1,042,190	45,742.50	1,675,967	397,274,298	5,471,262	174,703	59,010,931

[1] Also 9,515 tons of old tailings.
[2] Includes 1,903 tons of concentrate from 9,515 tons of old tailings.
[3] Also 300 tons of old tailings.
[4] Includes 27 tons of concentrate from 300 tons of old tailings.

Mine production of metals from Arizona concentrates in 1925—Continued

BY KINDS OF CONCENTRATES

	Concentrates	Gold	Silver	Copper	Lead	Zinc	Total value of metal
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*	
Dry and siliceous	1,278	79.75	102,429	2,968	1,088,670	----------	$167,870
Copper	1,033,228	41,466.06	1,369,562	397,216,178	----------	----------	58,212,353
Lead	7,507	4,196.05	203,635	54,159	4,380,640	----------	616,870
Zinc	177	.64	341	993	1,952	174,703	13,838

AVERAGE RECOVERABLE CONTENT

	Short tons	*Fine ounces per ton*	*Fine ounces per ton*	*Per cent*	*Per cent*	*Per cent*	*Value per ton*
Dry and siliceous	1,278	0.06	80.15	0.12	42.59	----------	$131.35
Copper	1,033,228	.04	1.33	19.22	----------	----------	56.34
Lead	7,507	.56	27.13	.36	29.18	----------	82.17
Zinc	177	----------	1.93	.28	.55	49.35	78.18
	1,042,190	.04	1.61	19.06	.26	.01	56.62

Of the first-class material smelted copper ore constituted the largest part. The mines of the Verde district, in Yavapai County, and those of the Warren district, in Cochise County, together produced 91 per cent of the copper ore smelted. Lead ore came next, followed by dry and siliceous ore and lead-zinc ore.

Mine production of metals from Arizona crude ore shipped to smelters in 1925

BY COUNTIES

	Crude ore to smelter	Gold	Silver	Copper	Lead	Zinc	Total value of metal
	Short tons	*Fine ounces*	*Fineounces*	*Pounds*	*Pounds*	*Pounds*	
Cochise	1,238,366	59,027.28	2,059,487	110,954,960	14,625,471	6,745,392	$20,190,156
Gila	91,314	684.37	309,230	8,819,185	256,981	189,440	1,517,831
Graham	57	5.80	377	137	32,926	----------	3,265
Greenlee	41,474	527.08	25,885	6,371,851	4,721	----------	934,074
Maricopa	283	203.59	605	6,020	51,000	----------	9,920
Mohave	3,118	1,229.14	58,611	30,135	371,254	----------	102,663
Pima	43,919	130.19	61,588	5,521,100	882,537	23,750	908,015
Pinal	64,403	2,836.56	347,096	12,177,581	554,016	----------	2,076,938
Santa Cruz	2,563	63.45	38,548	36,553	860,834	14,365	109,240
Yavapai	1,497,285	59,907.81	2,593,708	152,380,114	152,489	184,466	24,703,698
Yuma	755	201.38	6,567	67,677	103,916	----------	27,371
	2,983,537	124,816.65	5,501,702	296,365,313	17,896,145	7,157,413	50,583,171

BY KINDS OF ORE

Dry and siliceous	29,109	5,983.37	354,068	137,050	43,193	----------	$392,629
Copper	2,865,743	113,318.33	4,524,178	295,380,453	151	----------	47,426,314
Lead	73,463	5,488.15	604,508	812,865	15,069,238	----------	1,959,439
Zinc	305	1.00	1,389	7,556	7,359	240,808	20,999
Copper-lead	382	25.80	17,436	27,166	319,185	----------	44,260
Lead-zinc	14,535	----------	123	223	2,457,019	6,916,605	739,539

Mine production of metals from Arizona crude ore shipped to smelters in 1925—Continued

AVERAGE RECOVERABLE CONTENT

	Crude ore to smelter	Gold	Silver	Copper	Lead	Zinc	Total value of metal
	Short tons	*Fine ounces per ton*	*Fine ounces per ton*	*Per cent*	*Per cent*	*Per cent*	*Value per ton*
Dry and siliceous	29,109	0.206	12.16	0.24	0.07	----------	$13.49
Copper:							
Oxidized	435,232	.010	.94	5.13	----------	----------	17.27
Sulphide	2,430,511	.041	1.69	5.07	----------	----------	16.42
Lead:							
Oxidized	68,996	.070	7.84	.55	9.79	----------	25.50
Sulphide	4,467	.151	14.29	.53	17.40	----------	44.82
Zinc: Sulphide	305	.003	4.55	1.24	1.21	39.48	68.85
Copper-lead: Sulphide	382	.068	45.64	3.56	41.78	----------	115.86
Lead-zinc:							
Oxidized	520	----------	----------	----------	10.01	18.21	45.11
Sulphide	14,015	----------	.01	.01	8.39	24.00	51.09
	2,983,537	.042	1.84	4.97	.30	.12	16.95

REVIEW BY COUNTIES AND DISTRICTS

Mine production of gold, silver, copper, lead, and zinc in Arizona in 1925

County	Gold					Silver[1]	
	Placers		Lode mines		Total value		
	Fine ounces	Value	Fine ounces	Value		Fine ounces	Value
Cochise	----------	----------	67,443.31	$1,394,177	$1,394,177	2,316,531	$1,607,673
Gila	----------	----------	8,990.06	185,841	185,841	628,625	436,266
Graham	----------	----------	5.81	120	120	417	289
Greenlee	----------	----------	3,927.52	81,189	81,189	141,559	98,242
Maricopa	6.00	$124	1,031.16	21,316	21,440	1,958	1,359
Mohave	----------	----------	29,103.46	601,622	601,622	187,387	130,047
Pima	6.10	126	14,719.01	304,269	304,395	272,947	189,426
Pinal	----------	----------	10,689.71	220,976	220,976	890,322	617,883
Santa Cruz	----------	----------	65.50	1,354	1,354	46,595	32,337
Yavapai	113.73	2,351	65,154.64	1,346,866	1,349,217	2,762,143	1,916,927
Yuma	80.59	1,666	404.32	8,358	10,024	9,384	6,512
	206.42	4,267	201,534.50	4,166,088	4,170,355	7,257,868	5,036,961
Total, 1924	151.85	3,139	235,843.89	4,875,326	4,878,465	6,649,276	4,455,015

County	Copper		Lead		Zinc		Total value
	Pounds	Value	Pounds	Value	Pounds	Value	
Cochise	146,468,392	$20,798,512	18,707,288	$1,627,534	6,745,392	$512,650	$25,940,546
Gila	175,613,783	24,937,157	263,658	22,938	189,440	14,398	25,596,600
Graham	191	27	41,740	3,631	----------	----------	4,067
Greenlee	59,464,187	8,443,914	4,721	411	----------	----------	8,623,756
Maricopa	6,020	855	51,000	4,437	----------	----------	28,091
Mohave	37,051	5,261	1,532,256	133,306	174,703	13,277	883,513
Pima	74,783,386	10,619,241	897,057	78,044	23,750	1,805	11,192,911
Pinal	102,858,322	14,605,882	574,546	49,986	----------	----------	15,494,727
Santa Cruz	38,780	5,507	1,021,591	88,878	14,365	1,092	129,168
Yavapai	154,017,340	21,870,462	510,893	44,448	184,466	14,019	25,195,073
Yuma	67,677	9,610	271,267	23,600	----------	----------	49,746
	713,355,129	101,296,428	23,876,017	2,077,213	7,332,116	557,241	113,138,198
Total, 1924	677,752,013	88,785,514	18,642,314	1,491,385	----------	----------	99,610,379

[1] Includes placer production.

Ore, tailings, etc., sold or treated, lode mines producing, and average value of ore, tailings, etc., in Arizona, 1924–25

County	Ore, tailings, etc., sold or treated, 1925 (short tons)		Number of lode mines producing		Average total value per ton [1]		Average value per ton in gold and silver [1]	
	Total	Increase or decrease	1924	1925	1924	1925	1924	1925
Cochise	2,593,876	+7,753	40	53	$8.78	$10.00	$1.13	$1.16
Gila	8,512,562	+99,540	23	32	3.04	3.01	.07	.07
Graham	161	+34	6	3	46.41	25.26	4.48	2.54
Greenlee	1,528,431	+441,792	4	5	5.06	5.64	.11	.12
Maricopa	14,943	−33,220	9	8	1.22	1.87	1.21	1.52
Mohave	73,736	−50,941	52	57	15.26	11.98	14.34	9.92
Pima	3,367,586	+357,033	28	47	3.06	3.32	.12	.15
Pinal	3,286,347	+148,405	21	46	4.11	4.71	.21	.26
Santa Cruz	3,586	−346	32	37	39.18	36.02	13.51	9.40
Yavapai	1,544,507	+137,028	37	59	15.31	16.31	1.96	2.11
Yuma	1,647	−201	14	21	28.05	29.19	5.97	9.02
	20,927,382	+1,106,877	266	368	5.03	5.41	.47	.44

[1] Placer product excluded.

COCHISE COUNTY

The mine production of gold, copper, lead, and zinc in Cochise County was larger in 1925 than in 1924; the quantity of silver produced was slightly less, but the value increased. There were 53 producers, 13 more than in 1924, and the county led all others in the value of its metal output, showing a gain of $3,237,297. The value of all metals increased—gold from $1,324,227 to $1,394,177, silver from $1,595,348 to $1,607,673, copper from $18,617,872 to $20,798,512, and lead from $1,165,802 to $1,627,534. The value of the zinc produced in Cochise County in 1925 was $512,650; none was produced in 1924. The yield of each metal is given in the table on page 572. Ore of smelting grade (1,238,366 tons) yielded on the average $16.30 in metals a ton. Of the ore smelted, 1,136,047 tons were classified as copper ore, of which 399,613 tons were estimated to be oxidized ore and 736,434 tons sulphide ore. All the lead ore, old tailings, and slag (117,981 tons), as well as the lead concentrate, were shipped to plants outside the State and yielded 6,897.47 ounces of gold, 682,156 ounces of silver, 796,391 pounds of copper, and 16,346,563 pounds of lead. First-class lead ore amounted to 65,667 tons; all but 197 tons of it were oxidized. Copper ore of milling grade yielded 218,789 tons of copper concentrate, which were also shipped for smelting. There was no output from placers.

Benson district.—A large slag dump at Benson, the result of several years' operation of lead furnaces in the eighties, has been worked over at different times by lessees. What is left of the dump is said to contain an average of 2 ounces of silver to the ton and 3 per cent of lead. Shipments from the dump to the El Paso smelter began November 13 at the rate of 200 tons a day. Some of the lead ore treated years ago in the Benson furnaces came from the Schuylkill mine near Chloride, Mohave County, by way of Kingman, across Colorado River at Needles, then around by Mojave, Calif., to Benson. In 1883 the Atlanta mine at Bisbee produced lead carbonate and was leased to the smelting company. Ore from Sonora, Mexico, also was smelted.

California district.—About 4,000 tons of silver-lead ore from the property of the Hilltop Metal Mining Co. were hauled 24 miles by autotruck to the railroad station at Rodeo, N. Mex., for shipment to El Paso Tex. The Hilltop group of claims includes the Victor, Galena Queen, Hard Luck, Outlook, and Long Dump lode claims. Litigation has retarded work on the Irish Mag claim, but a sample lot of ore shipped contained 16 per cent of lead and 10 ounces of silver to the ton.

Charleston district.—The Arlington claim, a small producer of oxidized lead ore in 1924, was abandoned after making a final shipment which was received at the smelter early in 1925.

Cochise district (*Johnson, Dragoon, Golden Rule*).—Seven lode mines in the Cochise district produced copper ore, lead ore, and a small lot of siliceous silver ore, which amounted to 2,568 tons, yielding $3,283 in gold, 2,588 ounces of silver, 218,513 pounds of copper, and 35,673 pounds of lead, valued in all at $39,212, or $15.27 a ton. Most of the ore was shipped by a lessee working the property of the Arizona United Development Co. Small lots of ore were also shipped from the Golden Eagle, Peabody, Regine, and Centurion mines. Lessees of the Golden Eagle property reported an output of about 200 tons of lead ore, containing on the average 0.65 ounce of gold and 2.9 ounces of silver to the ton and 5.9 per cent of lead. All this ore was shipped to El Paso, Tex.

Dos Cabezas and Teviston districts.—Small lots of lead and copper oxidized ore were shipped from the Dos Cabezas district, and one lot of gold ore from the Henry Clay mine was treated by amalgamation and concentration. The mines in the district produced a total of 173 tons of ore, yielding $1,497 in gold, 529 ounces of silver, 3,182 pounds of copper, and 14,925 pounds of lead, valued in all at $3,614, or $20.89 a ton. Lead ore was shipped from the Le Roy claim and oxidized copper ore from the Wolverine group. If the plans of the Central Copper Co. are carried out, about a million dollars will be expended during the next year. The construction projected includes a 500-ton milling plant, which is to be the first unit of a larger plant, and an 8,000-foot tramway from the coarse-crushing plant to the Elma mine.

Huachuca Mountain district.—From the Panama, or Manila mine, 132 tons of lead ore, containing a little silver, were shipped to El Paso, Tex. This ore, which averaged about 1.5 ounces of silver to the ton and contained from 14 to 31 per cent of lead, was mined from a bedded deposit in limestone through a 300-foot vertical shaft. Small lots of ore were also shipped from the Golden Fleece and El Tesora claims.

Swisshelm district (*Webb, Elfrida*).—The Scheerer property, 40 miles north of Douglas and 16 miles east of Elfrida, is opened by a 100-foot shaft; it produced oxidized lead ore containing silver and a little gold. The Four Horse property, also a producer of lead ore, consists of two groups of claims about three quarters of a mile apart, opened by tunnels, the longest one being 650 feet. Some of the ore was treated in jigs, and the concentrate, mixed with the crude ore, was shipped to the smelter at El Paso, Tex. The Great American mine, the largest operator in the district, produced considerable siliceous silver ore containing gold. This ore was hauled to the railroad at Webb and shipped to El Paso, Tex., and Douglas, Ariz.

Tombstone district.—Thirteen producers in the Tombstone district reported an output of 27,760 tons of first-class ore and old tailings which yielded $55,328 in gold, 241,381 ounces of silver, 77,340 pounds of copper, 1,527,019 pounds of lead, and 32,592 pounds of zinc, valued in all at $369,157, or $13.30 a ton. The output included 130 tons of siliceous silver ore from which bullion was recovered at a cyanidation plant. Ore of shipping grade, including some waste-dump ore, amounted to 17,055 tons, yielding on the average $2.63 in gold and 11.90 ounces of silver to the ton, 0.17 per cent of copper, 1.11 per cent of lead, and also included one car of zinc ore from the San Juan claim which yielded 33.9 per cent of zinc. Material milled, principally old tailings, amounted to 10,575 tons, from which were recovered 2,168 tons of lead concentrate yielding on the average $4.82 in gold and 17.28 ounces of silver to the ton, 0.40 per cent of copper, and 26.49 per cent of lead. The old tailings from the Grand Central dump, near Fairbank, being treated by flotation, contained an average of 5 ounces of silver to the ton and 5 per cent of lead, and produced most of the concentrate. From the waste dump of the Silver Thread mine lessees shipped considerable ore which was used for converter lining at a copper plant.

Silver ore was produced from the Argenta, Hamilton, Old Guard, and Solstice properties, and from the Mellgren group, operated by the Bonanza Leasing Co.

Lead ore, containing silver, was sold to the El Paso smelter from the Gallagher property at Charleston. This ore, which contained 15 per cent of lead and 6 ounces of silver to the ton, was mined by lessees. Of the total ore produced in the district, 15,936 tons came from 24 claims of the Bunker Hill Mines Co.,[1] operated by 60 lessees, who shipped 2,734 tons of silver-lead ore and concentrates to El Paso, Tex., and 13,082 tons of silver ore to the smelter at Douglas, Ariz. One lessee, working surface ore of the Head Center mine, treated 120 tons of silver ore by cyanidation. The old mine dumps were made profitable, with higher prices for lead and silver, by screening and tabling fines which yielded a high-grade silver concentrate. Prior to 1900 the average assay of samples from the old dumps at Tombstone was 0.5 ounce of silver and 0.03 ounce of gold to the ton and 2 per cent of lead. The average concentrate recovered from the dump ores in 1925 contained about 80 ounces of silver and 0.35 ounce of gold to the ton and 20 per cent of lead. A 50-ton Forrester-Rexman rod mill was put in operation to grind the ore of the Emerald mine dump.

Turquoise district (*Courtland, Pearce, Gleeson*).—Twelve lode mines in the Turquoise district produced 19,854 tons of ore and 2,655 tons of old tailings, which yielded $35,028 in gold, 173,369 ounces of silver, 677,425 pounds of copper, and 1,531,919 pounds of lead, valued in all at $384,817, or $17.10 a ton. The most important producer in the district was the Mystery mine, 1 mile north of Gleeson, which has been shipping lead ore only about a year; its output in 1925 amounted to 500 tons of ore a month containing on the average 0.75 ounce of gold and 15 ounces of silver to the ton and 10 per cent of lead. Other producers

[1] Phelps Dodge Corporation Ann. Rept. for 1925.

of lead ore were the Tejon, Silver Bill, and Sadie claims. Copper ore was shipped by lessees from the Maid of Sunshine, Germania, and April Fool mines, and also from the Great Western and Leadville properties. About 300 tons of copper ore and lead ore were shipped by the Mona Leasing Co. Old tailing, containing gold and silver, and crude siliceous ore were shipped from the Commonwealth mill dump to Douglas. No results were reported in leaching ore "in place" at the Copper Belle mine. The fire that was started purposely in the Copper Belle mine to roast the sulphide ore was reported to be gradually dying out, and preliminary work on the second stage of the experiment, the leaching of the ore body, may begin in 1926.

Warren district (Bisbee, Lowell, Warren, Don Luis).—Altogether the mines of the Warren district produced 2,529,459 tons of ore yielding $1,294,300 in gold, 1,835,024 ounces of silver, 145,432,743 pounds of copper, 13,313,415 pounds of lead, and 6,712,800 pounds of zinc, valued in all at $24,887,697, or $9.84 a ton.

At the Copper Queen mines[2] the production of copper ore and lead ore, including ore mined by lessees, was increased through underground mining in the limestone area. Added to the output in 1925 were the smelting and milling ores from the underground porphyry area. At Sacramento Hill the ore output decreased slightly, but as the heavier part of the overburden is stripped the concentrator can run at capacity. In 1925 the copper market did not warrant capacity operation. Experimental work at the concentrator continued but only at 70 per cent of capacity in order to keep the concentrate production in line with the desired output of copper from the Copper Queen branch.

Altogether 1,300,248 tons of ore, averaging 1.59 per cent of copper, were milled with a ratio of concentration of 5.95 to 1. The total copper recovery was 87.97 per cent and the sulphide recovery was equivalent to 92.65 per cent. Experimental work on the elimination of iron pyrite so as to make a higher grade concentrate was continued. Finer grinding and the use of different selective reagents in flotation were being tried out in a reconstructed section of the concentrator. From Sacramento Hill 897,307 tons of ore averaging 0.79 per cent of copper went to the leaching dumps. The first wash of the leach dump area, to which irrigation is being confined, was completed in July. From the beginning of leaching operations up to January 1, 1926, about 30 per cent of the copper in the part being treated has been extracted. The precipitation plant with an additional tail launder system worked satisfactorily and gave an apparent recovery of 94.4 per cent. The smelter built many years ago at Douglas continued to operate satisfactorily with a combination of blast and reverberatory furnaces. The blast furnaces are not now used except in emergencies, but additional reverberatory furnaces recently installed are expected to eliminate the heavy loss in blast-furnace dust when fine concentrates, production of which has increased, are smelted. The annual report of the company operating the Copper Queen mines gives the following production:

[2] Phelps Dodge Corporation Ann. Rept. for 1925.

Ore and metals contained in output of Copper Queen mines in 1925

Kind of material	Total (dry weight)	Gold	Silver	Copper	Lead	Manganese
	Short tons	*Ounces*	*Ounces*	*Pounds*	*Pounds*	*Pounds*
Underground limestone:						
Copper ore	520,692	22,772	580,828	63,256,830		
Silver ore to Douglas	634	110	10,024	2,331		
Silver-lead ore	34,396	1,510	221,804	585,439	7,103,853	
Manganese ore	94					81,923
Underground porphyry:						
Smelting ore	7,995		1,084	369,224		
Milling ore	44,244	193	2,863	1,719,456		
Sacramento Hill:						
Smelting ore	76,148	129	21,793	9,518,110		
Milling ore	1,255,165	7,280	240,992	39,794,449		
Lease ore	623	13	344	110,293		
Precipitates: From leach heap	746		1	1,023,846		
Total	1,940,737	32,907	1,079,733	116,379,978	7,103,853	81,923

The Calumet & Arizona mines[3] produced 490,681 dry tons of ore from the Junction No. 3 and Cole shafts. Of this ore 454,867 tons were treated at the company's smelter at Douglas. Shipments of low-grade copper sulphide ore to the milling plant of the Old Dominion Copper Co. at Globe, the International smelter at Miami, and the El Paso Smelting Co. at El Paso, Tex., amounted to 20,032 tons, 5,217 tons, and 9,423 tons, respectively. Lead ore—141 tons—was shipped to El Paso, Tex., and 14,265 tons of lead-zinc ore went to the Ozark Smelting & Mining Co. at Coffeyville, Kans. There were also 1,633 tons of lead-zinc ore in transit. During 1925 an average of 1,868 tons of dry ore and concentrates was smelted daily at Douglas, and the total output of blister copper was 103,949,220 pounds, as compared with 79,025,610 pounds in 1924. This was the greatest output in the history of the smelter and was due to the smelting of a large quantity (85,927 tons) of New Cornelia (Ajo) concentrate, in addition to 37,441 tons of custom ore.

The chief discoveries of new ore were in the vicinity of the Campbell shaft on the 1,800-foot level, where several ore bodies were partly developed; the most important is 250 feet southwest of the Campbell shaft and is uniformly high grade. A small precipitating plant was put in operation on the 1,500-foot level to recover copper in solution and to furnish neutral water[4] for the pumps. The operation of this small plant has demonstrated the possibilities of leaching some of the extensive areas of low-grade ore. Dividends amounting to $2,571,028 were distributed to stockholders, making a total of $54,305,500 paid since the organization of the company.

A consolidation[5] of the Shattuck Arizona and the Denn-Arizona companies was completed by the end of 1925. During the year the corporation proved that the low-grade ores in the Shattuck mine could be concentrated by flotation alone at a lower cost than by the table concentration and flotation formerly used. The mines were operated continuously and produced 69,166 dry tons of carbonate

[3] Calumet & Arizona Mining Co. Ann. Rept. for 1925.
[4] Arizona Mining Journal, "Water treatment and underground leaching": Sept. 30, 1926, p. 5. Subject of paper read before Arizona chapter Am. Min. Congress, Bisbee, Ariz., Sept. 13-14, 1926.
[5] Shattuck Denn Mining Corporation Ann. Rept. for 1925.

lead ore, of which 14,771 tons were smelted and 35,962 tons were milled. Other shipments of first-class smelting ore consisted of 16,572 tons of oxidized copper ore and 1,861 tons of siliceous copper ore. From the carbonate ore smelted 1,207,536 pounds of lead, 102,258 ounces of silver, and 1,473.25 ounces of gold were recovered. The lead concentrate yielded 2,550,275 pounds of lead, 115,376 ounces of silver, and 1,803.90 ounces of gold. The oxidized copper ore yielded 1,828,699 pounds of copper, 34,246 ounces of silver, and 633.14 ounces of gold. From the siliceous copper ores smelted 1,250.78 ounces of gold, 13,067 ounces of silver, and 14,406 pounds of copper were recovered.

All the lead produced from direct shipments and from concentrates, with the gold and silver recovered from lead ores, was sold to the smelters. The average price received for lead recovered from direct shipments was 9.446 cents a pound, and that for lead recovered from concentrates was 8.942 cents a pound. The average value of the siliceous ore was $19.03 a ton and the net operating cost of it was $10.07 a ton. None of the copper produced in 1925 was sold; it was carried at cost on the corporation books, and no profit was recorded from its production. The report of the corporation says:

> For the 10 months ended October 31, 1925, the exploration and development work done at the Shattuck mine by the Shattuck Arizona Copper Co. amounted to 7,732 feet of drifts, crosscuts, intermediates, and raises. All of the exploration work was planned to prospect for new copper ore bodies, while the development was for both lead and copper. The average cost per foot of advance was $9.61, or 43 cents less than in 1924. The exploration and development at the Shattuck mine for the last two months of 1925, by the Shattuck Denn Mining Corporation, amounted to 1,315 feet at an average cost per foot of $10.06. The total for the year was 9,047 feet at an average cost per foot of $9.79. There was done 1 foot of exploration and development for each 1.83 dry tons of copper ore mined, or two and one-quarter times as much development per ton of copper ore mined as in the prior year.
>
> The work at the Denn shaft in November and December amounted to $10,190.52 and was to prepare for development to begin in the year 1926.

A description[6] of the mill as operated in 1920, when it included table concentration and flotation, and in 1925, when it was revised to treat the ore entirely by flotation, was published in October. This description is of special interest because the company saves 75 per cent of the gold, 65 per cent of the silver, and 90 per cent of the lead in a carbonate ore after treating it with sodium sulphide and coal tar.

COCONINO COUNTY

Development work at several mining properties was carried on in 1925, but no production of ore was reported.

GILA COUNTY

There were 32 producers in Gila County, 9 more than in 1924. They reported 8,512,562 tons of ore and matte sold or treated in 1925, compared with 8,413,022 tons of ore in 1924. Gold increased from $173,412 to $185,841, silver decreased from 652,794 to 628,625 fine ounces, copper from 190,458,709 to 175,613,783 pounds, and lead from 368,580 to 263,658 pounds. The zinc produced in 1925 amounted to 189,440

[6] Young, G. J., "The Shattuck-Arizona mill": Eng. and Min. Jour.-Press, vol. 120, Oct. 17, 1925, p. 612.

pounds; none was produced in 1924. The county ranked second in the State in value of metal output. This value increased from $25,590,361 in 1924 to $25,596,600 in 1925. Copper ore was treated at Globe and Miami, but the lead ores and part of the copper ores were shipped to smelting plants outside the county. Of the copper ore smelted, 83,955 tons were sulphide and 6,272 tons were oxidized ore. The 91,314 tons of smelting ore shipped had an average value of $16.62 a ton in recovered metals, and the 309,323 tons of concentrates, all copper, had an average value of $77.29 a ton.

Banner district.—Six producers in the Banner district (Gila and Pinal Counties) reported a total output of 6,277 tons of ore, which yielded $1,389 in gold, 2,152 ounces of silver, 325,518 pounds of copper, and 98,929 pounds of lead, valued at $57,712, or $9.19 a ton. The most important part of this output was shipped from the Christmas mine of the Gila Copper Sulphide Co., 1 mile west of the Gila River in the extreme southwest corner of Gila County. This mine, which is opened by an 830-foot vertical shaft, was a large producer for a number of years. During 1916, 1917, and 1918 the average content of the Christmas ore was 0.007 ounce of gold and 0.27 ounce of silver to the ton, 2.82 per cent of copper, 18.1 per cent of iron, 32.2 per cent of insoluble, and 26 per cent of lime. The ore was largely oxidized and was mined from replacement deposits in limestone. The Seventy-Nine property was not worked on company account, but a little lead ore was shipped by a caretaker of the property. One lot of oxidized ore containing silver and vanadate of lead was shipped from the C. & B. mine, opened by a tunnel 200 feet long and a vertical shaft 35 feet deep. The owner of the C. & B. property reports a reserve of 5,000 tons of 9 per cent lead ore containing 2 per cent of vanadium oxide.

Globe district (Miami).—Twenty-two producers in the Globe district reported a total output of 8,500,300 tons of ore and 5,957 tons of matte, which yielded $184,374 in gold, 626,184 ounces of silver, 175,272,327 pounds of copper, 179,145 pounds of lead, and 189,440 pounds of zinc, valued in all at $25,537,599, or $3 a ton. Most of the ore (8,414,911 tons) was concentrated and yielded 309,323 tons of concentrates, which, with 85,045 tons of crude ore, were smelted. Virtually all of the concentrate and first-class ore, with 5,000 tons of matte and smelter cleanings from the Old Dominion plant, went to smelting plants in the district, but nearly all the lead ore and a little copper ore from other properties was shipped to El Paso, Tex. The largest output was from the Inspiration mine, which yielded 5,067,038 tons of copper ore. The next largest producer was the Miami Copper Co., with 2,919,600 tons. The Old Dominion, Iron Cap, New Dominion, Superior & Boston, and Kearsarge & Monadnock claims also produced copper ore.

From the Inspiration property[7] a total of 81,944,321 pounds of copper, or a monthly average of 6,828,693 pounds, was produced during 1925. The ore mined and treated averaged 1.038 per cent of copper, which was lower than had been anticipated, as the Live Oak section of the property did not yield ore of the grade expected. The

[7] Inspiration Consolidated Copper Co. Ann. Rept. for 1925.

copper produced in 1925 was recovered from the treatment of 5,067,438 tons of ore, including 3,521,172 tons of Inspiration concentrating ore, 1,531,703 tons of Live Oak concentrating ore, 7,386 tons of Inspiration ore of smelting grade, 905 tons of Live Oak ore of smelting grade, 5,928 tons of Warrior ore of smelting grade, and 344 tons of ore used in leaching tests which produced 5,364 pounds of copper.

The average copper content of ore from the Inspiration section was 1.013 per cent, Warrior 5.164 per cent, and Live Oak 1.076 per cent. The smelter assay of the total concentrates produced was 35.183 per cent of copper; flotation concentrate averaged 38.07 per cent and table concentrate 3.94 per cent. The ratio of concentration was 42.5 to 1. The recovery of copper in concentrate, calculated from assays and weights of ore and tailing, was 79.67 per cent and the recovery of copper sulphides was 94.41 per cent. The cost of fine copper produced, including depreciation but excluding depletion and Federal taxes, amounted to 12.2858 cents a pound. Dividends paid to stockholders in 1925 amounted to $1,181,967, and a third dividend of $590,984 was declared payable January 4, 1926. The leaching plant now being constructed is expected to be in operation in October, 1926.

From the Miami property[8] 51,851,274 pounds of refined copper were produced from 2,919,600 tons of milling ore. The gravity and flotation concentrator was operated 359 days; it treated an average of 8,133 tons of ore a day, from which 4,320,940 pounds of copper were produced a month. Dividends amounting to $933,893 were paid to stockholders in 1925, making a total of $29,861,464 paid since the company was organized. The annual report of the company says:

> The entire tonnage stoped was produced by caving methods of mining, and a considerable reduction in cost of mining as compared with last year is shown. This is due to the introduction of a system of mining in the low-grade ore body which is particularly adapted to the caving and drawing of high lifts of ore—in this case 300 feet—with good control of the caving and drawing, and hence of the grade of the ore. As mine operations during the last three months were confined exclusively to low-grade ore, resulting in the production of 893,658 tons, cost figures for these three months in addition to the annual figures given below include the average amount of development and breaking ground and are normal in all particulars and may be anticipated as the approximate average mining cost for the entire low-grade ore body. This ore is being mined at the rate of 27.8 tons per shift underground. The cost of mining was as follows:

	Year	Last 3 months
Development	$0.24572	$0.10000
Stoping	.36433	.16214
Electric haulage	.07862	.05811
Pumping	.00271	.00169
General underground	.02171	.01300
Mine ventilation, etc	.03198	.01826
Underground lighting	.00532	.00251
Hoisting—No. 5 shaft	.04024	.03978
Engineering and sampling	.01781	.01252
Mine surface	.02928	.02329
Mine accident expense	.02067	.01621
Total	.85839	.44151

[8] Miami Copper Co. Ann. Rept. for 1925.

Mill operations resulted as follows:

	Year	Last 3 months
Ore milled, short tons	2,919,600	893,658
Copper in ore, per cent	1.287	0.972
Concentrate produced, short tons	97,770	29,457
Copper in concentrate, per cent	27.911	22.358
Copper in concentrate, pounds	54,577,076	13,171,610
Copper per ton of ore, do	18.693	14.739
Mill extraction, per cent	72.60	75.79

The cost of milling ore to the point of concentrate on board cars is as follows:

	Year	Last 3 months
Coarse crushing	$0.08848	$0.10217
Fine grinding	.22565	.18929
Flotation	.12997	.10677
Concentrate retreatment	.00401	.01239
Concentrate disposal	.01335	.01455
Tailing disposal	.02215	.03244
Water	.03397	.02604
General mill	.05404	.04425
Total	.57162	.52790

The cost of milling for the year was reduced approximately $0.06 and for the last three months on low-grade ore $0.10 per ton as compared with the previous year. This reduced cost is principally due to increased tonnage, and a further reduction is anticipated. The general concentrate at present assays about 23 per cent copper. This results from combining 17 per cent concentrate from half the mill with a 30 per cent concentrate from the retreatment plant serving the remainder of the mill. It is proposed to install additional retreatment equipment to bring the entire product up to 30 per cent, which will effect a net saving by reducing freight and smelting charges on the mill product.

The cost of producing refined copper up to concentrate on board cars at Miami was as follows:

	Year		Last 3 months	
	Per ton ore, 17.760 pounds copper	Per pound copper	Per ton ore, 14.005 pounds copper	Per pound copper
Mining	$0.85342	$0.04805	$0.43745	$0.03125
Milling	.57162	.03219	.52790	.03771
General	.19483	.01097	.12254	.00875
Total	1.61987	.09121	1.08789	.07771

The ore reserves stand as follows:

	Short tons	Per cent total copper	Per cent soluble copper
Sulphide ore	67,917,514	1.01	0.12
Mixed ore	7,000,000	1.83	1.34

From the Old Dominion property [9] a total of 355,623 dry tons of ore was mined, of which 13,370 tons were smelting ore averaging 8.54 per cent of copper, 342,015 tons were concentrating ore averaging 3.99 per cent, and 238 tons were siliceous ore, used for converter lining, averaging 1.43 per cent. The total metals produced from ore and concentrate were 27,283,655 pounds of copper, 150,782 ounces of silver, and 5,752 ounces of gold. The Old Dominion smelter was idle, and the high-grade smelting ore and all the concentrate were shipped to the International smelter at Miami. The copper was refined at Raritan, N. J., and the copper sold by the Phelps Dodge Corporation at New York. This procedure is said to have considerably increased the production of copper and lowered the cost per pound during the first three months of 1925. Considerable unserviceable equipment in the smelter was sold for scrap, but everything else in the smelter was left in good condition for use if operation should become desirable. No dividends were paid to stockholders in 1925. The annual report of the company says:

> During the year the "A" shaft station on the twenty-second level was completed and connections made with the 20–12 winze; the Grey shaft was sunk from the sixteenth to the eighteenth level and a raise under it put through from the twentieth to the eighteenth level; 20–12 winze was deepened to the twenty-fourth level and a crosscut to the north run on the 2,400 far enough to tap the water. A deep-well pump was installed in the winze to pump this water to the twenty-second level, and for nine months this has been unwatering the ground below the twenty-second level at the rate of 1,300 gallons per minute. As a result the water is now down some distance below the twenty-second level at the "A" shaft. Exploration and development and the cost of pumping water from the mine accounts for slightly over 2 cents per pound of copper produced. * * *.
>
> An important discovery of concentrating ore was made on the twentieth level, which occurs in crushed Pinal schist with a schist footwall and quartzite hanging wall. Although low in grade, the average to date being 2.45 per cent copper, it will be cheap to mine and mill and will give a high-grade concentrate. Although not yet being considered as a commercial ore in our ore reserves, it will prove profitable on a good copper market. Through improved mining methods as well as improved concentrating methods the company is able to treat lower grade ores than those formerly treated with equally good financial results.

The Superior & Boston mine [10] during the fiscal year ended September 30, 1925, produced 14,432 dry tons of ore averaging 3.75 per cent of copper and 10.31 ounces of silver to the ton. This ore produced 1,081,472 pounds of copper and 148,830 ounces of silver, for which the company received $133,396 after deducting freight and smelting charges, or an average of $9.24 a ton. Of the total output 38 per cent was produced from the Dewey vein, 2 per cent from the Rigby vein, 35 per cent from the Footwall vein, and 25 per cent from the North vein. The most extensive development work done was the sinking of the McGaw shaft below the 1,400-foot level. The North and Dewey veins produced most of the ore, as in the previous year. Ore was discovered in the Dewey vein, east of the Mescal fault, early in the fiscal year, and a fair grade of ore was also opened in the North or Old Dominion vein.

The Arizona Commercial Mining Co.[11] shipped ore, 86.6 per cent of which was sent to the Old Dominion concentrator at Globe and the balance to the International smelter at Miami for converter lining.

---

[9] Old Dominion Co. Ann. Rept. for 1925.
[10] Superior & Boston Copper Co. Ann. Rept. for year ended Sept. 30, 1925.
[11] Arizona Commercial Mining Co. Ann. Rept. for 1925.

The total output amounted to 75,499 tons of ore, of which 65,390 tons was milling ore averaging 5.90 per cent of copper and 10,109 tons was siliceous ore averaging 6 per cent. The total production was 7,860,866 pounds of refined copper, 39,430 ounces of silver, and 1,972 ounces of gold. The sales of refined copper amounted to 7,665,353 pounds, which sold for 14.05 cents a pound, and the gold and silver sold for $1,138,109. Expenditures for mining, treatment, and refining were $700,102, selling and administration $75,955, and depreciation $56,221. The total dividends paid since October 10, 1916, including $265,000 paid in 1925, amounted to $1,749,000.

The mill of the Iron Cap Copper Co.[12] was operated the first six months of the current year and the mine the entire year. The Arizona Commercial Mining Co., which brought suit to establish ownership of the western section of the Iron Cap property, succeeded in preventing shipments of milling ore from that section. Ore from other parts of the mine was not sufficient to run the Iron Cap mill at the usual rate. Later the courts gave the Iron Cap company clear title to the veins and ores in dispute. From 55,035 tons of ore mined 34,580 tons were milled, producing 4,771 tons of concentrate. The concentrate contained 2,047,423 pounds of copper, 31,020 ounces of silver, and 102.19 ounces of gold. From 20,455 tons of smelting ore 2,849,297 pounds of copper, 135,167 ounces of silver, and 147.88 ounces of gold were recovered. The cost of milling a dry ton of ore treated in the 350-ton concentration-flotation plant was $1.61. The tailing from this plant amounted to 29,808 dry tons and contained 0.276 per cent of copper and 0.158 ounce of silver to the ton. The copper sold for $636,989.39, silver $103,018, gold $2,659.84, and the company received from other income $24,529.84, or a total of $767,197.07. Transportation, refining, marketing, mining, and milling charges amounted to $455,503.78, which, with taxes, interest, discount on bonds, and administrative and litigation expenses, totaled $526,856.70. Deduction of this amount from the total income left a profit of $240,340.38 before depreciation and depletion charges for the current year, amounting to $94,478.98, were calculated. The total gain for the year was $145,861.40. No dividends were paid to stockholders in 1925.

Green Valley district.—About 30 tons of gold ore, containing a little silver, from the Columbia and Independent mines, were treated in a small mill, and the average value of metals recovered in bullion was $16.85 to the ton of ore.

Summit district.—Copper sulphide ore from the Gibson Consolidated property was hauled 9 miles to the railroad at Miami. The company has a 100-ton concentration mill which has not been operated for the past six years.

GRAHAM COUNTY

Aravaipa district.—Oxidized lead ore from the Silver Coin and Tolman Babcock properties was hauled 52 miles to the Southern Pacific Railroad at Glenbar and shipped to El Paso, Tex. A 50-ton

[12] Iron Cap Copper Co. Thirteenth Ann. Rept., for 1925.

flotation mill was under construction at the Tolman Babcock property during the latter part of 1925. The mine is opened by a shaft 126 feet deep and has about 500 feet of crosscuts. A small concentrating plant at the Silver King property treated lead-silver ore.

Rattlesnake district.—Development work at the Long Tom No. 2 claims resulted in the shipment of a small lot of ore containing silver and gold.

GREENLEE COUNTY

In 1925 all the metals produced in Greenlee County by five producers showed gains except lead. Gold increased from $54,619 to $81,189, silver from 92,250 to 141,559 fine ounces, and copper from 41,048,563 to 59,464,187 pounds. The ore increased from 1,086,639 to 1,528,431 tons, and the total value of metals from $5,494,592 to $8,623,756. Lead decreased from 10,036 to 4,721 pounds.

Ash Peak district.—The ore shipped from the dump of the Ash Peak mines to the El Paso smelter contained silver principally and a little gold.

Copper Mountain and Greenlee districts (Morenci, Metcalf, Clifton).—Excluding the output of the Ash Peak and Mayflower districts, the figures given for Greenlee County represent the output from Copper Mountain and Greenlee districts. Two producers mined 45 tons of ore in the Copper Mountain district, and 1,528,277 dry tons of ore were mined by the Phelps Dodge Corporation[13] in the Greenlee district. Almost the entire output, or 1,486,896 tons, came from the Humboldt, Petaluma, and Clay mines, and from widely scattered claims operated by lessees. This mill ore was treated in the No. 6 concentration-flotation plant at Morenci. The smelter at Clifton treated a total of 179,717 tons of material, including 127,264 dry tons of concentrate from the Morenci mill, and produced 59,272,857 pounds of copper. Improved reverberatory practice and minor metallurgical improvements resulted in better recovery and lower costs.

Mayflower district.—Lead sulphide ore containing 5.2 ounces of silver to the ton, 11.9 per cent of lead, and a little copper from the Wampum claim was hauled 10 miles to York and shipped to El Paso, Tex.

MARICOPA COUNTY

Gold and silver mills in Maricopa County treated 14,650 tons of old tailing and 10 tons of ore, which yielded gold and silver bullion valued at $18,046. Ore shipped directly to the smelter, amounting to 283 tons, yielded metals valued at $9,920. A little placer bullion, valued at $125, was reported by a merchant who trades merchandise for small lots of placer dust.

Big Horn district.—Copper-gold ore containing a little silver was produced from the Alaskan claim and silver ore from the Red Stone property, both of which are 28 miles south of Aguila.

San Domingo district.—A small lot of copper ore containing a little silver from the Ozark Copper property was shipped to the Hayden smelter.

[13] Phelps Dodge Corporation Ann. Rept. for 1925.

Vulture district.—In September there was much activity in the Vulture district, when the Tonopah Belmont Development Co. took over the MacNeill mine. The cyanidation plant at the Vulture property was operated until June, when it was dismantled after producing approximately $14,000 in gold from the treatment of old tailing. The Gold Hill claim, which is opened by a shaft about 40 feet deep, produced a small lot of gold ore which was hauled 15 miles to Aguila, the loading station on the Santa Fe Railroad. In July the Tonopah Belmont Development Co. took an option on the MacNeill property, consiting of eight claims. After carefully examining the ground near by, locations were made for 25 other claims, making the mineral holding of the company 572 acres. Water is supplied from an 8-inch bore drilled 500 feet deep, 2 miles southwest of the MacNeill mine. After water level was found 65 feet from the surface, water was pumped at the rate of 90 gallons a minute. The Washington vein in the mine has an average width of 3 feet, and the Uncle Sam vein is said to be just as large. Both these veins have been developed since the company started work in September.

MOHAVE COUNTY

In Mohave County 57 producers, 5 more than in 1924, mined 73,736 tons of ore, a decrease of 50,941 tons. The gold declined from $1,623,028 to $601,622, due to the closing of the United Eastern and Gold Road mines, and silver from 246,934 to 187,387 fine ounces. Copper increased from 10,634 to 37,051 pounds and lead from 1,416,717 to 1,532,256 pounds, but the total value of metals decreased from $1,903,204 to $883,513. Zinc, amounting to 174,703 pounds, was produced in 1925; none was produced in 1924. The ore treated by amalgamation or cyanidation, mainly the latter, amounted to 45,143 tons, which yielded $572,537 in gold and 19,313 ounces of silver, having a total value of $585,940, or an average of $12.98 a ton. The concentrating ores (25,475 tons) yielded 1,499 tons of concentrates, against 1,202 tons of concentrates from 25,326 tons of ore in 1924. The concentrates in 1925 had a total value in metals of $194,910, or an average of $130.03 a ton. Crude ore shipped to smelters amounted to 3,118 tons, against 576 tons in 1924, and had a total value in metals of $102,663, or an average of $32.93 a ton.

The opening of the sampling and ore-purchasing plant at Kingman in October, 1924, by the Western Ore Purchasing Co. has stimulated small-scale mining operations in the Wallapai and San Francisco districts. The plant also receives ore from mines in Yavapai and Yuma Counties as well as from mines in California and Nevada.

Aubrey district.—Gold and silver ore in small lots, amounting to 27 tons, was shipped to the sampler at Kingman from the Boulder and Black Jack claims. The ore contained $9 to $20 in gold and 11 to 30 ounces of silver to the ton.

Cedar Valley district.—Lessees of the Fillmore Mining Co. shipped small lots of lead sulphide ore, and the company completed plans for a 25-ton concentrating plant to treat ore from the Bunker Hill property. The Cedar Gold & Silver Mining Co. shipped silver ore to the sampler at Kingman.

Chemehuevis district.—Lessees shipped several small lots of ore from various properties. Some of the ore mined from the Schoolmarm claim was concentrated, yielding a product containing considerable gold and a little silver. Lead sulphide ore containing gold chiefly and some silver was shipped from the Summit claim.

Cottonwood district.—The Walkover mine, about 8 miles east of Hackberry on the Santa Fe Railroad, produced siliceous gold ore containing a little copper.

Hackberry district.—A small lot of lead sulphide ore containing silver was shipped by a lessee from the Hackberry property.

Indian Secret district.—Very small lots of rich silver ore were mined from the White Hills property by lessees who found it profitable to ship the ore to the sampler at Kingman. The mines of the district were sensational producers of rich silver ore early in 1892, when shipments of chloride of silver ore reported to be worth $1,000 to $10,000 a ton were made. The total value of the ore produced to 1904 is estimated at $6,000,000. The mines and ores were discussed in a recent article[14] on the mining possibilities of the White Hills district.

Lost Basin district.—The Grey Copper group, 7 miles southeast from Greggs Ferry, was worked and ore containing 7 per cent of copper, $3 in gold, and 2 ounces of silver to the ton was shipped to the Hayden smelter.

Maynard district.—From the Dean mine a little lead sulphide ore containing silver was shipped by the Santa Fe Gold & Silver Mining Co.

Music Mountain district.—Lead ore sorted from various old dumps, amounting to 28 tons, was shipped to the sampler at Kingman in small lots and yielded 22.78 ounces of gold, 335 ounces of silver, 500 pounds of copper, and 5,600 pounds of lead, valued in all at $1,262, or $45.07 a ton.

Owens district.—Many small lots of lead ore, ranging from 2 to 9 tons, were produced and sold to the Kingman sampler from mines in the Potts Mountain region, which is included in the Owens district. The total output of the district amounted to 25,005 tons of siliceous silver ore and lead ore, most of which was mined and milled from the Senator, Alta, and McCracken claims operated by the Signal Mines Co., which closed its 100-ton concentration-flotation plant early in 1925. Some lead ore was also produced from the Otsego, Red Top, Gold Leaf, and Lucky Strike mines.

San Francisco district (*Oatman, Gold Road, Vivian*).—Eleven producers in the San Francisco district reported the mining and the milling by cyanidation of 33,826 tons of ore, from which were recovered $502,019 in gold and 11,721 ounces of silver, valued together at $510,153, or $15.08 a ton. Most of this output was gold ore produced from Tom Reed property by lessees and was treated in the Tom Reed mill, run almost continuously but at less than half capacity. Some of the dump ore of the United Eastern mine was also treated at the Tom Reed mill as well as ore from the Gold Road, Lexington, Apex-Pioneer, and Gold Dust mines. Gold bullion was shipped from the Telluride cyanidation plant, which, with the mine, was later

[14] Thompson, A. P., Arizona Min. Jour., Nov. 15, 1925.

reported sold at sheriff's sale. Lessees operating the 30-ton amalgamation mill of the Orphan mine, at Secret Pass in the River Range, milled about 200 tons of ore and saved 50 per cent of the gold by amalgamation. Mining operations of the United Eastern Mining Co.[15] at Oatman were discontinued in May, 1924, as the known ore bodies were exhausted. Since that time a thorough mill clean-up yielded in the neighborhood of $60,000, and other small incomes have been realized from rentals, tailing pond skimmings, and ore sorted by lessees from the Big Jim and No. 1 shaft dumps. The Acme group of claims, which joins the Gold Road property on the north, was optioned by the United Eastern company. This property had been opened by a shaft and 365 feet of drifting. After doing 495 feet of additional drifting the United Eastern company gave up the lease, having found no paying veins.

Union Pass district.—The Katherine mine, about 40 miles northwest of Kingman, has been under development since 1900. The history of the mine and a detailed description[16] of the new milling plant were recently published. A 75-ton cyanidation plant began work in June and was enlarged to 180 tons in December. Ore is treated in this plant by the all-sliming process, followed by Dorr counter-current decantation. Zinc dust is used to precipitate the gold and silver from solution. The mine is opened by a 400-foot shaft and 9,640 feet of drifts. About 1,250 feet of this development work was done in 1925. The ore, which is highly siliceous, occurs with calcite in fissure veins in granite.

Wallapai district (Cerbat, Chloride, Kingman, Mineral Park, Stockton Hill).—The mines in this district showed more activity in 1925 than for years. This activity was due to the establishment at Kingman of an ore sampler operated by the Western Ore Purchasing Co., which purchased considerable ore in small lots. Twenty-two operators of various properties shipped 3,169 tons of ore, yielding $15,675 in gold, 38,744 ounces of silver, 26,646 pounds of copper, 341,646 pounds of lead, and 174,703 pounds of zinc, valued in all at $89,346, or $28.19 a ton. Lead ore was mined from the White Horse, Distaff, and Golden Bullet claims by the Wishon Exploration Co., the chief producer, and similar ore was also shipped from the Daisell claim. Lead-zinc ore of milling grade was produced from the Banner, C. O. D., Golconda, and Premier properties. Other producers of lead ore were the New Moon, St. Louis, Silver Star, and Champion mines. Siliceous silver ore and some lead sulphide ore were recovered from the old dumps of the Altata, Elkhart, Juno, and Pinkham mines. From the Buckeye, Panama, Rico, and Paymaster claims siliceous silver ore was produced and gold ore from the Tintic property.

Weaver district.—Prospecting resulted in the shipment of a few test lots of lead ore, and some siliceous gold ore was treated at an amalgamation plant in the district. Some very high-grade gold quartz from the Betelgeuze claim was ground in a hand mortar and the bullion sold in San Francisco.

---

[15] United Eastern Mining Co. Ann. Rept. for 1924 and 1925.
[16] Thurmond, F. Le Roi, "The mill of the Katherine Gold Mining Co.": Arizona Min. Jour., p. 9, Oct. 30, 1925.

PIMA COUNTY

In 1925 the mine production of all metals in Pima County increased in quantity and value. The largest increase was in the output of copper from low-grade disseminated ores mined in the Ajo district and treated by leaching and concentration. The number of producers rose from 29 to 48. The ore increased from 3,010,553 to 3,367,586 tons, gold from $228,470 to $304,395, silver from 208,745 to 272,947 fine ounces, copper from 67,279,575 to 74,783,386 pounds, lead from 415,953 to 897,057 pounds, and total value of metals from $9,215,229 to $11,192,911. Zinc, amounting to 23,750 pounds, was produced in 1925; none was produced in 1924. Pima, Pinal, and Yavapai Counties were the only ones in which there was a general increase in both quantity and value of output. Ore of shipping grade in Pima County aggregated 43,919 tons and yielded metals valued at $908,015. Milling plants treated 324 tons of ore that yielded gold and silver bullion having a total value of $4,838. The placer output amounted to $126 in gold and 1 ounce of silver.

Ajo district.—The output of the New Cornelia property[17] was 69,262,286 pounds of fine copper, 209,860 ounces of silver, and 14,355.92 ounces of gold. The ore treated amounted to 2,287,121 dry tons, averaging 1.391 per cent of copper (1.198 per cent sulphide and 0.193 per cent oxide of copper). Of the total ore mined 1,059,649 tons were carbonate ore averaging 1.157 per cent of copper, which was leached. The soluble copper in the carbonate ore averaged 1.059 per cent and the insoluble copper 0.098 per cent. The leached ore yielded 15,979,895 pounds of electrolytic copper and 1,305,265 pounds of cement copper. The concentrating plant treated an average of 6,582 tons of ore a day, or 31.26 per cent more than its designated capacity. The flotation concentrate produced contained 51,977,126 pounds of copper.

The estimated ore reserves at the end of the year were as follows: Carbonate ore containing more than 0.8 per cent of copper, 3,277,028 tons, averaging 1.25 per cent; sulphide ore having 0.8 per cent to 3 per cent of copper, 52,219,427 tons, averaging 1.31 per cent; and sulphide ore with more than 3 per cent of copper, 2,363,896 tons, averaging 3.65 per cent. Dividends paid to stockholders in 1925 amounted to $1,800,000, making a total, since dividends were first paid, of $7,650,000. Rickard[18] has outlined the mining and metallurgical development of the New Cornelia property.

Amole district.—Seven operators produced 150 tons of ore containing gold, silver, copper, and lead, and yielding on the average $18.90 in metals a ton. Half of the ore was shipping grade and half was treated by amalgamation or cyanidation. The Reilly Mines Co. shipped some copper ore while doing development work in the Old Yuma mine. Lead ore was shipped from the Bee Hive, La Plomosa, Arizona, and Mirage claims.

Arivaca district.—The output consisted of a clean-up of bullion from an old amalgamation mill and lead concentrate from milling ore of the Rosebud claim.

---

[17] New Cornelia Copper Co. Ann. Rept. for 1925.

[18] Rickard, T. A., "The later story of the New Cornelia enterprise": Eng. and Min. Jour.-Press, vol. 119, Feb. 14, 1925., p. 285.

Baboquivari district.—At the Allison mine, which is being developed, some siliceous gold ore was milled and gold-silver bullion and concentrate were produced. The mine is opened by a 400-foot shaft and has a tunnel 500 feet long. A mill on the property is equipped with four Hendy stamps. Early in 1926 the property was leased to the Tom Reed Gold Mines Co.

Cerro Colorado.—One lot of silver ore containing a little lead was shipped from the Silver Queen mine.

Cobabi district (*Comobabi*).—A small lot of copper-lead sulphide ore was produced from the Little Mary property. The mine is opened by an inclined shaft 150 feet deep and has a 50-ton oil flotation plant which was idle because of lack of water.

Coyote district.—Development of the Big Bonanza group continued until June, and some first-class sulphide copper ore containing silver and gold was shipped to the smelter at Hayden.

Empire district.—Six lode mines in the Empire district produced 1,162 tons of lead ore and 41 tons of zinc sulphide ore, yielding $833 in gold, 5,684 ounces of silver, 5,662 pounds of copper, 560,244 pounds of lead, and 23,750 pounds of zinc, valued in all at $56,128, or $46.66 a ton. The Lone Mountain, Verde Queen, and Lead Carbonate properties yielded most of the lead ore, and small lots were also shipped from the Total Wreck and Bunker Hill mines. The Pantano claim produced 41 tons of zinc ore assaying 33.8 per cent of zinc.

Greaterville district.—Six operators in the Greaterville district shipped 195 tons of sulphide lead ore, and small quantities of gold dust were sold to merchants. The output of the district was valued at $8,398, and the ore shipped yielded on the average $42.42 in metals a ton. Most of the ore came from the Conglomerate mine and was hauled 8 miles to Sonoita, a station on the Southern Pacific Railroad. The property was opened in September and has a vertical shaft 75 feet deep and 150 feet of drifts. Considerable milling ore is said to have been opened in this property and also in the St. Louis mine, which has been opened to a depth of 260 feet. From the Magdalena prospect 11 tons of silver ore were produced.

Helvetia district.—Eight producers of ore in the Helvetia district reported a total output of 319 tons, containing gold, silver, copper, and lead, and yielding on the average $26.02 in metals a ton. The Rosemont and Copper Duke mines yielded copper ore, and lessees of the Golden Gate, Fairview, Pauline, and Dimple properties shipped oxidized lead ore. A small lot of lead ore was also produced from the Rosemont property.

Papago district.—Four producers of lead ore in the Papago district reported an output of 156 tons, yielding $200 in gold, 1,408 ounces of silver, 1,313 pounds of copper, and 106,086 pounds of lead, valued in all at $10,593, or $67.90 a ton. Most of the lead ore came from the Sunshine and Sunrise claims operated by the Ramsdell Mines Co. One lot of sorted ore, from development work, was shipped from the Banner property.

Pima district (*Olive, San Xavier, Twin Buttes*).—Five operators in the Pima district produced 18,684 tons of ore, yielding $337 in gold, 39,475 ounces of silver, 2,407,585 pounds of copper, and 13,058 pounds of lead, valued in all at $370,746, or $19.84 a ton.

The largest shipper of copper ore was the Copper Queen mine of the Midland Copper Co. The ore from this property is hauled 9 miles over the Twin Buttes Railroad, a corporation owned and operated by the Midland Copper Co., to Sahuarita, a station on the Southern Pacific Railroad. The Copper Queen mine is opened by a shaft 700 feet deep at an incline of 72° and by levels every 50 feet below the 400-foot level. The ore, chiefly sulphide, occurs in a contact deposit of garnetized limestone. The mine was active the entire year, and approximately 2,000 feet of drifting and 300 feet of raising were done. Dividends paid to stockholders in 1925 amounted to $60,600, making the total dividends to date $107,400.

About 5 tons of sulphide lead ore were shipped from the San Carlos group, and small lots of similar ore were shipped from two other properties.

Silver Bell district.—The El Tiro mine, operated by the Western American Mines Co., produced copper ore containing a little silver and 3,018,931 pounds of copper. This output, with shipments of copper ore from the Imperial property and lead ore from the Arizona-Indiana mine, operated by the International Ore Separation Co., amounted to 23,168 tons and was valued at $447,382, or $19.31 a ton.

Silver Hill district.—The New Colorado mine, 20 miles from Amado, was a small producer of silver ore. Some silver ore was also shipped from the Good Luck claim.

PINAL COUNTY

The mine production in Pinal County showed large increases—ore from 3,137,942 to 3,286,347 tons, gold from $171,588 to $220,976, silver from 709,301 to 890,322 fine ounces, copper from 93,198,060 to 102,858,322 pounds, lead from 362,532 to 574,546 pounds, and total value of metals from $12,884,769 to $15,494,727. The number of producers in 1925 was 46, a gain of 24. Most of the ore came from the mines at Ray, and nearly all of it, or 3,221,603 tons, was of concentrating grade and yielded 286,766 tons of copper concentrates and 24 tons of lead concentrates. The ores of smelting grade aggregated 64,403 tons, and milling plants treated 180 tons of ore that yielded gold and silver bullion valued at $2,791.

Banner district.—See under Gila County.

Bunker Hill district (Copper Creek).—Nine producers in the Bunker Hill district reported an output of 645 tons of ore yielding $875 in gold, 18,368 ounces of silver, 96,105 pounds of copper, and 375,067 pounds of lead, valued in all at $59,901, or $92.87 a ton. Considerable copper-lead ore was shipped from the Blue Bird mine and 77 tons from the Bunker Hill property. Copper sulphide ore was shipped from the Fortuna and the Magma Chief properties. One lot of lead sulphide ore was shipped from the Carbonate claim operated by lessees.

Casa Grande district.—An experimental concentration plant was active a week on lead ores from the Orizaba group but has since been dismantled. At the Silver Reef property, 13 miles south of Casa Grande, about 1,000 tons of ore assaying 22 ounces of silver and some old tailing were shipped to the smelter at Hayden.

Goldfields district.—The Young Mines Co., operating the Mammoth property, produced a small quantity of gold and silver bullion.

Mineral Creek district (*Ray, Kelvin*).—The Ray Consolidated and the Ray Silver Lead property were the two chief producers.

The Ray Consolidated mine [19] produced 3,051,839 tons of ore averaging 1.50 per cent of copper, of which 84.45 per cent was recovered at the Hayden mill, and 15,521 tons of ore, averaging 1.69 per cent of copper, were shipped to the smelter for converter lining. The mining cost was 98 cents a ton, as compared with $1.10 a ton in 1924. These costs do not include depreciation or the usual charge of 15 cents a ton to cover extinguishment of cost of mine development. Of the total cost of 98 cents in 1925, 4 cents was for coarse crushing and loading, leaving a net mining cost of 94 cents a ton. The new flotation plant at Hayden made an average recovery in the last quarter of the current year equal to 88.2 per cent of the total copper content of the ore. A total of 3,037,700 dry tons of ore was treated, yielding 224,375 dry tons of concentrate averaging 17.147 per cent of copper.

The recovery of copper from the sulphide minerals was 93.92 per cent, and the recovery from carbonates and other oxidized copper minerals was 34.32 per cent. The milling cost, excluding the charge for depreciation, for which there was no cash outlay, was 63 cents a ton, as compared with 60 cents a ton in 1924. The gross copper contained in the concentrate was 76,947,957 pounds, as compared with 69,053,918 pounds for the year 1924; other ores shipped direct to the smelter contained 524,954 pounds of copper. The net production for the year from all sources, after allowing for smelter deduction, was 74,691,091 pounds, as compared with 67,017,981 pounds for the year 1924. The program of construction and improvement carried on during the past three years was almost completed at the end of 1925 and resulted in definite operating economies and marked increases in metallurgic efficiency. Only six of the seven completed sections of the Hayden mill were active during 1925.

Old Hat district.—Six operators in the Old Hat district shipped 21 tons of copper ore and 14 tons of lead ore, yielding metals valued at $2,122, or $60.63 a ton. The ore was mined from the Ætna, Apache, and Old Reliable properties.

Osborne district.—The Moon Anchor property was being developed, and 45 tons of oxidized lead ore were shipped to the smelter at El Paso, Tex.

Owl Head district.—About 100 tons of copper ore were shipped from the Wayside and Cinta de Plata properties to the smelter at Hayden.

Pioneer district (*Superior*).—The Magma Copper Co. was the chief producer of copper ore which, with the output of six other properties, amounted to 229,487 tons. Of this amount the Magma Copper Co.[20] produced 229,377 tons of ore containing an average of 6.50 per cent of copper, and 3.43 ounces of silver and 0.031 ounce of gold to the ton. Included in this output were 214 tons of ore mined by lessees from the Superior mine, that assayed 6.63 per cent of copper, and 1.50 ounces of silver and 0.10 ounce of gold to the ton. Custom ores purchased from various sources amounted to 261 tons and assayed 2.74 per cent of copper, and 18.93 ounces of silver and 0.005 ounce of gold to the ton. The total smelter output after deduction of all losses, including

[19] Ray Consolidated Copper Co. Seventeenth Ann. Rept., for 1925.
[20] Magma Copper Co. Ann. Rept. for 1925.

refining, was 27,020,516 pounds of copper, 719,881 ounces of silver, and 9,085.65 ounces of gold. The net cost of producing copper, after deduction of the value of gold and silver, was 7.51 cents a pound. The cost does not include any allowance for depreciation or interest, but includes all other fixed and general expenses.

The average output from the Magma mine was 628 tons of ore a day, most of which came from the stopes above the 1,900-foot level. Above the 650-foot level 5,207 tons of oxidized ore were mined that averaged 9.14 per cent of copper, and 7.39 ounces of silver and 0.056 ounce of gold to the ton. In 1925 the No. 2 shaft was deepened 69 feet, making a total depth of 2,630 feet, and the No. 3 shaft was continued about 100 feet below the 2,550-foot level. This level connects with No. 2 and No. 3 shafts. Crosscuts driven through the ore body at various points on the 2,250-foot level prove that it has these widths:

Crosscut	Width	Copper	Silver	Gold
	Feet	*Per cent*	*Ounces*	*Ounce*
No. 9	7.3	2.00	0.32	Trace.
No. 11	37.1	8.20	3.15	0.019
No. 13:				
North branch	10.0	3.15	.75	.008
Main vein	22.8	8.92	4.60	.040
No. 16	59.0	11.46	5.59	.037
No. 19	20.7	5.36	3.12	.007
No. 21	8.6	4.26	3.02	.020

The company report for 1925 says:

The ore shoot from No. 9 crosscut to the west face of the 2,250-foot level is 1,050 feet long and averages 27.5 feet in width. The average assays of the ore for this ore body are 8.3 per cent copper, 3.94 ounces silver, and 0.025 ounce gold. The vein, as crosscut in No. 9 crosscut, was badly shattered by a fault, and this accounts for the low-grade ore in the crosscut. We have drifted east of this crosscut about 50 feet on the ore, and after we left the fault encountered good ore. The ore shoot on the 2,250-foot level, after it is fully developed to the east of No. 9 crosscut, will probably be about 1,200 feet long.

The 2,250-foot level has been connected with the 2,000-foot level by two raises, one on the east end of the ore body and another on the west end. An intermediate level, the 2,125 level, has been started from the raise on the east end and a connection is being driven on this level to No. 3 shaft. This intermediate level crosscuts the vein at No. 6½ crosscut, and the vein at this crosscut was 12.6 feet wide and assayed 6.33 per cent copper, 1.79 ounces silver, and 0.01 ounce gold.

The predominating minerals in the vein on the 2,250-foot level are chalcopyrite and bornite. There is considerably more chalcopyrite present than there is in the levels immediately above. The chalcopyrite predominates over the bornite in the crosscuts on the 2,250-foot level. The sulphides in the vein are more plentiful than in the levels above, and this is very encouraging. It seems as though the average grade will be maintained even though the bornite is decreasing in depth. The chalcopyrite is of a very good grade and is more abundant than the sulphides were in the levels above.

An attempt was made to do work on the east 2,000-foot level, but on account of the working conditions there only two crosscuts were driven through the vein. Crosscuts Nos. E. 28 and E. 34 were driven through the vein on this level. The widths and assays of the vein in these crosscuts are as follows:

Crosscut	Width	Copper	Silver	Gold	Zinc
	Feet	*Per cent*	*Ounces*	*Ounce*	*Per cent*
E. 28 XC South	49.0	0.53	0.54	Trace.	4.91
E. 34 XC South	20.5	1.72	1.50	0.009	4.49

Crosscut No. E. 28 South was driven along drill hole No. 2,002 at a point approximately 2,200 feet east of the main crosscut. It shows a vein of good width with considerable massive sulphide but of low value. Crosscut No. E. 34 South was driven along drill hole No. 2,005 at the face of the E. 2,000 drift. It is approximately 2,700 feet east of the main crosscut. This crosscut also showed a very promising vein. On the hanging wall of the vein there were 5.25 feet of heavy sulphide that assayed 5.30 per cent copper, 4.77 ounces silver, and 0.025 ounce gold. It is the present plan to connect the East 2,000 and the East 1,600 foot levels in order to improve ventilating conditions on the East 2,000-foot, and to continue the drift east on this level.

The East 1,600-foot level was driven a distance of 621 feet east of No. E. 14 crosscut. It was in the vein for 310 feet of this distance, and for 285 feet for a width of 4.6 feet averaged 2.32 per cent copper, 4.34 ounces silver, 0.021 ounce gold, and 7.05 per cent zinc.

Several crosscuts were driven across the vein from the East 1,600-foot drift. These crosscuts showed a vein with a wide mineralization, but the average values were considerably lower than those shown in the drift, and they are not in commercial ore. * * *

Dividends paid to stockholders by the Magma Copper Co. from its organization to the end of 1925 amounted to $2,316,232.50, of which two dividends totaling $612,232.50 were paid in 1925; a dividend of $306,116.25 was declared payable January 15, 1926.

Riverside district.—Seven small producers in the Riverside district reported an output of 200 tons of ore yielding $223 in gold, 2,757 ounces of silver, 741 pounds of copper, and 39,532 pounds of lead, valued in all at $5,680, or $28.40 a ton. Silver ore was shipped from the Spencer claim of the Shawmut group, gold ore from the Buell estate and Gold Hill properties, and lead ore from the Gold Watch and three other claims.

Saddle Mountain district.—Four operators in the Saddle Mountain district shipped 601 tons of ore. The Old Odell mine, worked by lessees of the Adjust Mining Co., produced 493 tons of siliceous ore yielding 27.90 ounces of gold and 8,874 ounces of silver. The predominating minerals are pyrite and sphalerite, with occasional galena and barite. All of the district output, including small lots of silver ore produced from the Ryan and Argentite properties, was shipped to the Hayden smelter. Copper sulphide ore was shipped from the Senator claim, 1½ miles above Christmas.

Summit district.—The Lorraine Copper Co. shipped a car of sulphide copper ore mined during development work. The mine is opened by a vertical shaft 125 feet deep and has a tunnel 106 feet long.

SANTA CRUZ COUNTY

Thirty-seven producers in Santa Cruz County reported an output of 3,586 tons of ore, or 346 tons less than was reported by 32 producers in 1924. Ore of shipping grade amounted to 2,563 tons yielding metals valued at $109,240. Ore to concentrating mills amounted to 227 tons and produced 34 tons of lead concentrate yielding metals valued at $4,154.

Harshaw district.—Five lode mines in the Harshaw district produced 1,534 tons of lead ore and old tailing, all of which was shipped to El Paso, Tex. The chief producers of ore were the Flux and World's Fair properties, worked by lessees. One car of lead ore was shipped from the Hardshell mine and 796 tons of old jig tailings

from the Trench mine. The tailings yielded on the average about 8 ounces of silver to the ton and 6 per cent of lead. Two cars of ore assaying 27 ounces of silver to the ton, 16 per cent of lead, and 12 per cent of zinc were shipped from the January and Norton claims.

Oro Blanco district.—Four small lots of ore, containing mainly lead and silver, were shipped from prospects. The North Star Mining & Development Co. erected a 30-ton flotation plant on the Ruby-Idaho property.

Pajarito district.—Eight producers in the Pajarito district reported an output of 240 tons of ore yielding $534 in gold, 7,317 ounces of silver, 1,033 pounds of copper, and 62,649 pounds of lead, valued in all at $11,209, or $46.70 a ton. Owing to the scarcity of water in the district, milling was restricted, especially the treatment of lead ores containing gold and silver. Ore from old waste dumps that could be profitably treated was concentrated in a roughly built milling plant that had a Kinkaid mill and tables. All the ore and concentrates produced were sold to an ore purchaser in Nogales.

Patagonia district (*Washington, Duquesne*).—Lessees working the Duquesne, Gladstone, and Mowry mines reported an output of 584 tons of ore, yielding $68 in gold, 2,750 ounces of silver, 13,672 pounds of copper, and 130,715 pounds of lead, valued in all at $15,290, or $26.18 a ton. All the ore was of shipping grade, and most of it was hauled 18 miles to Zorilla, Sonora, Mexico, where it was loaded on cars of the Southern Pacific Railroad and shipped to El Paso, Tex.

Tyndall district (*Alto*).—Mine operators reported considerable activity in this district, where 15 properties produced 1,181 tons of ore, nearly all of which was first-class smelting ore. The output was $603 in gold, 13,812 ounces of silver, 18,405 pounds of copper, 451,927 pounds of lead, and 14,365 pounds of zinc, valued in all at $53,213, or $45.06 a ton. The most important shipper of ore was the Jefferson mine. Other producers of lead ore were the Apache, Joplin, Alto, Glove, Bland, Eureka, San Felipe, Rosario, Royal Blue, Wandering Jew, and Victor claims. Copper ore was shipped from the Cobre, Joplin, and Wandering Jew claims. Late in 1925 some lead ore from the Eureka claim was treated in a flotation mill. About 30 tons of lead-zinc ore were produced from the Glove property and shipped to Amarillo, Tex. These properties are about 12 miles from Patagonia, the loading station on the Southern Pacific Railroad.

Wrightson district.—The Dixie Queen and Mansfield claims were under development, and two lots of lead sulphide ore were shipped to El Paso, Tex.

YAVAPAI COUNTY

The mine production of all metals in Yavapai County showed large gains in quantity and value. There were 68 producers, 25 more than in 1924. The ouput of ore and old tailings increased from 1,407,479 to 1,544,507 tons, gold from $1,239,157 to $1,349,217, silver from 2,269,788 to 2,762,143 fine ounces, copper from 143,348,230 to 154,017,340 pounds, lead from 118,041 to 510,893 pounds, and the total value from $21,547,976 to $25,195,073. Zinc amounting to 184,466 pounds was produced in 1925; no zinc was reported in 1924.

Of the first-class ore shipped to smelters 1,494,239 tons, or all but 3,046 tons, were sulphide ore. The smelting ore yielded on the average $16.50 in metals a ton. Concentrates amounting to 9,987 tons, derived from 40,035 tons of ore and 300 tons of old tailings, yielded metals valued at $423,733. The placer output was $2,351 in gold and 13 ounces of silver, against $2,226 in gold and 20 ounces of silver in 1924

Agua Fria district.—At the Binghampton property, 6 miles from Mayer, the mine and concentrator were closed April 1 after 5,297 tons of ore were milled, yielding 411 tons of copper concentrate that contained a little silver. Ore averaging 12 per cent of copper was shipped to the smelter at Humboldt from the Minor mine, which was being developed by the Redlands Copper Co. The mine is opened to a depth of 250 feet and has 200 feet of drifts.

In March the United Eastern Mining Co.[21] started development work at the Barbara property; it sank a two-compartment shaft 341 feet and drove 715 feet of crosscuts on the 300-foot level. Two diamond-drill holes driven 660 and 657 feet in opposite directions found no additional ore.

Big Bug district.—Ten operators in the Big Bug district shipped 21,883 tons of ore and old tailing, yielding $53,414 in gold, 50,945 ounces of silver, 793,342 pounds of copper, and 45,831 pounds of lead, valued in all at $205,412, or $9.39 a ton. In addition to this output four placer operators produced $1,501 in gold and 8 ounces of silver. Of the ore produced 9,961 tons were directly smelted, from which 854.20 ounces of gold, 21,798 ounces of silver, and 514,744 pounds of copper were recovered, and 5,103 tons of ore were concentrated, yielding 1,321 tons of concentrate, which yielded 211.84 ounces of gold, 10,676 ounces of silver, 167,361 pounds of copper, and 45,831 pounds of lead. A small quantity of gold bullion was recovered at an amalgamation mill. Old tailings from the McCabe mill dump, containing gold, silver, and copper, were shipped to the smelter at Humboldt and some were reconcentrated. Old tailings were also shipped from Arizona City, 2 miles southeast of Mayer. The Bluebell mine was the largest producer of copper ore, most of which was directly smelted; the remainder was concentrated in the mill at Humboldt. The Arizona Silver Co. shipped very rich sulphide lead ore and milled a low-grade ore containing a little zinc. One car of first-class ore shipped in November assayed 300 ounces of silver to the ton and 48 per cent of lead. The mine is opened by an inclined shaft 530 feet deep. Iron ore containing gold and silver was shipped to Humboldt from the Iron King mine.

Black Canyon district.—Four operators in the Black Canyon district shipped 208 tons of ore, yielding gold, silver, copper, and lead, valued at $9,202, or $44.24 a ton. Silver ore, carrying gold and a little copper, was shipped from the Gold Crown or the old Silver Cord property to the smelter at Hayden. One lot of siliceous gold ore was shipped to the smelter from the Parker group. The Kay Copper Co., in the southern part of the district, continued to develop its copper property; on the 1,200 and 1,500 foot levels diamond drilling followed by drifting has opened sulphide ore.

Blackhills district.—Siliceous copper ore containing a little zinc was shipped to Humboldt from the Shylock mine.

[21] United Eastern Mining Co. Ann. Rept. for 1924–25.

Castle Creek district.—A small quantity of gold bullion containing a little silver was produced at the mills of the Golden Astor and Robey mines.

Cherry Creek district.—Operators developing the Logan and Copper King properties reported the recovery of a little gold bullion from ores treated by amalgamation.

Copper Basin district.—A car of copper ore from the Copper Basin property of the Phelps Dodge Corporation was shipped to the smelter at Humboldt.

Eureka district.—Work was resumed in December at the Copper King property of the Arizona Hillside Development Co. A shaft 600 feet deep exposes sulphide ore that is a replacement deposit in schist. Ore containing 51 per cent of zinc and a little copper, lead, and silver was shipped to Amarillo, Tex. Lead ore from the Cowboy and Lawrence groups was shipped to El Paso, Tex.

Hassayampa district.—Eleven lode mines in the Hassayampa district produced 1,239 tons of ore, yielding $4,026 in gold, 10,396 ounces of silver, 150,164 pounds of copper, and 97,625 pounds of lead, valued in all at $41,057, or $33.14 a ton. One lot of bullion shipped by a placer operator contained $158 in gold. Development work at the Storm Cloud mine which had been idle for 10 years resulted in an output of about 800 tons of ore, yielding 44 ounces of gold, 3,110 ounces of silver, and 127,668 pounds of copper. The mine is opened by two tunnels 500 and 800 feet long. Several cars of lead ore containing silver and a little gold were shipped from the Josephine mine, which is part of the Sheldon-Superior group. Lead ore containing gold and silver was also shipped from the Sundance property. Siliceous gold ore containing a little silver and copper was produced from the Golden Eagle group, 15 miles south of Prescott.

Martinez district.—Lessees working the Congress property produced several hundred tons of gold ore, most of which was shipped to the smelters at Hayden and Humboldt. As recently as 1910 the mine was a large producer of gold. The mill dump contains about 600,000 tons of old tailing, which may be re-treated by flotation in 1926.

Peck district.—A small lot of gold ore from the E. H. C. group was shipped to a smelter.

Pine Grove district.—One car of lead ore, containing silver and gold, was shipped from the property of the Blue Bird Mines Co. to the smelter at El Paso, Tex.

Silver Mountain district.—A small quantity of gold bullion was produced from the Gold Blossom claim, 35 miles north of Kirkland, which is equipped with a 5-ton Gibson mill and a concentrating table.

Thumb Butte district.—The Madizelle Mines Co. did some development work in the Derby mine and from ore milled it shipped some gold bullion containing a little silver.

Turkey Creek district (Bolada).—The Buckeye property produced 14 tons of lead ore which were shipped to the smelter at El Paso, Tex. The ore assayed on the average 14.8 ounces of silver to the ton and 21.5 per cent of lead.

Verde district (Jerome).—Four mines in the Verde district made an output of gold, silver, and copper which compared favorably with that of the Globe and Warren districts. The Verde district has been a large producer of copper ore since 1883 and especially since 1894. Recently the ore production has come mainly from mines of the

United Verde Copper Co. and United Verde Extension Mining Co. Both of these companies have smelting plants that were active in 1924 and 1925.

The United Verde Copper Co. was the largest producer of gold, silver, and copper in Arizona in 1925; it paid dividends aggregating $1,800,000 during the current year but issues no statement of production. The ore body of the United Verde mine reaches the surface, and an oxidized zone extends to the 160-foot level. At present steam shovels are mining the oxidized ore from open-cut workings at the rate of about 150,000 yards a month. These open cuts are gradually working into the hot and burning stopes of the upper levels. Two vertical shafts, No. 3 and No. 4, reach the 1,950 and 1,000 foot levels, respectively. The No. 4 shaft connects with the main haulage adit, the Hopewell tunnel, which is 6,600 feet long, trends north-northeast, and serves as a general outlet for the ore mined. An adit, 1,200 feet long on the 500-foot level, gives general access to the deposit, and from this level the No. 6 shaft is sunk to the 1,950-foot level. Still another shaft, called No. 5, extends from the 800-foot to the 2,500-foot level.

The ore body is opened to the 1,950-foot level, but diamond-drill holes have exposed it to the 2,700-foot level. The levels are 150 feet apart, and drifts and other workings on them aggregate many miles in length. The cross section of the rudely cylindrical ore body measures approximately 700 by 800 feet. Plans for a flotation plant to eliminate the pyrite were under consideration at the close of the year. Recently the history, production, and geology of the mines, and the costs of mining have been reviewed by several writers.[22]

Operations at the United Verde Extension mine and smelter continued throughout the year. A total of 43,720,324 pounds of copper was produced from smelting 180,763 dry tons of crude ore and 2,546 dry tons of custom concentrate. The ore smelted averaged 11.53 per cent of copper, and 0.046 ounce of gold and 2.34 ounces of silver to the ton. The concentrate smelted averaged 6.40 per cent of copper, and 0.331 ounce of gold and 17.19 ounces of silver to the ton. Ore shipped amounted to 4,170 dry tons and averaged 7.26 per cent of copper, and 0.048 ounce of gold and 4.02 ounces of silver to the ton. The cost of producing copper in 1925 included these charges: Mining, 2.46 cents; smelting, 2.32 cents; freight on ore, 0.08 cent; freight (on bullion), refining, and selling, 1.80 cents; other expenses, 0.27 cent; a total of 6.93 cents a pound.

This cost does not include charges for depreciation, depletion, or taxes. Gross revenue from metals and ore produced amounted to $6,706,647 which, when added to other revenue ($280,897), amounted to $6,987,544. Deductions of charges for mine and smelter operation, freight, refining, selling, and other expenses amounted to $3,636,210. Earnings from operations were $3,351,334, less depletion and depreciation of $2,974,913, leaving a net profit of $376,421 to surplus. Dividends paid to stockholders in 1925 amounted to $2.25 a share, or $2,362,500. Of this amount 21.8 cents a share was paid out of earned surplus and $2.032 a share was paid out of depletion reserve account.

[22] Smith, H. D., and Sirdevan, W. H., "Mining methods and costs at the United Verde mine": Trans. Am. Inst. Min. and Met. Eng., vol. 66, pp. 127–181, 1922; also in Arizona Min. Jour., May 30, 1925. Young, G. J., "Mining methods at United Verde mine": Eng. & Min. Jour.-Press, pp. 357–360, Feb. 28, 1925, and pp. 397–401, Mar. 7, 1925. Lindgren, W., Ore deposits of the Jerome and Bradshaw Mountains Quadrangles, Ariz.: U. S. Geol. Survey Bull. 782, 1926, 192 pp.

Development of the United Verde Extension ground in the upper levels to the westward opened a body of high-grade ore on the 800-foot level. Drifting and diamond drilling in the footwall to the west of the main fault did not disclose a continuation of the main ore body. In consequence the Edith shaft was continued from the 1,700 to the 1,900 foot level, and crosscuts will be driven on the 1,800 and 1,900 foot levels under the large body of pyrite ore exposed in the north end of the mine on the 1,500, 1,600, and 1,700 foot levels. At the smelter of the United Verde Extension Co. reverberatory furnace No. 1 was active 232 days; No. 2, 169 days; and the blast furnace, 56 days.

No ore was shipped from the Verde Central mine,[23] which joins the United Verde property on the south, and comprises 38 mining claims covering 523 acres. The igneous rocks exposed comprise greenstone, porphyry, and diorite, and are capped on a part of the property by sedimentary sandstones, limestones, and shales. So far as known, the ore is confined to the igneous rocks; it lies in a fracture zone in the greenstone and also on the contact of the greenstone and porphyry. The ore is a mixture of chalcopyrite, pyrite, and a siliceous gangue and assays 1 to 20 per cent of copper.

The property is opened by two shafts, 1,050 feet and 1,456 feet deep; the deeper shaft is vertical and has three compartments. Altogether, 22,000 feet of drifting, crosscutting, and raising was completed at the end of 1925. Two ore zones were opened by the shafts on the contact of the greenstone and porphyry on the 800 and 1,000 foot levels, and in a fracture zone in greenstone. The following paragraph is from the company's annual report:

> The contact ore body so far developed is about 800 feet long and from 2 to 12 feet in width. This ore body contains shoots of high-grade ore. For a distance of 900 feet on the 1,000-foot level the fracture zone is about 20 feet wide. It contains a large amount of low-grade ore and an ore shoot about 140 feet long and 14 feet wide, assaying about 6 per cent copper. This ore zone has been explored from the vertical shaft on the eleventh, twelfth, thirteenth, and fourteenth levels, and the ore has been found to be continuous throughout this distance. Recent exploration on the 600-foot level and tunnel level has disclosed that this ore shoot goes nearly to surface. On the fourteenth level, which is 1,456 feet below the collar of the shaft, the ore zone has widened out to 40 feet and contains considerable high-grade ore. A raise from this level is now in 10 per cent copper ore. The general conditions for ore at greater depth are very good, and it is planned to explore this ore zone by deeper workings.

Walker district (Lynx Creek).—Six operators in the Walker district produced 24,351 tons of ore. Of this output 24,183 tons was ore of milling grade and yielded 6,655 tons of concentrate, containing gold, silver, copper, and lead. The ore of shipping grade amounted to 93 tons, containing the same metals. Gold and silver bullion valued at $1,438 was recovered from 75 tons of ore treated in amalgamation plants. In addition to this, two placer operators produced $313 in gold and 2 ounces of silver. Altogether the output of the district was $70,227 in gold, 127,767 ounces of silver, 806,852 pounds of copper, and 318,187 pounds of lead, valued in all at $301,152. The ore yielded on the average $12.35 in metals a ton. The Sheldon mine was the largest producer. Sinking the mine shaft to 800 feet opened up considerable new ore. Lessees shipped some gold ore from the Poland and Neptune claims, and a small lot of lead ore was shipped from the Walcott and Davis claims.

[23] Verde Central Mines (Inc.), Calumet & Arizona Mining Co. Ann. Rept. for 1925.

Walnut Grove district (*Wagoner*).—Two producers of ore and one placer operator reported an output of $416 in gold, 571 ounces of silver, 425 pounds of copper, and 7,891 pounds of lead, valued in all at $1,559. The ore, amounting to 32 tons, was produced from prospects in the district.

White Picacho district.—The Hassayampa Placer Gold Mining Co., working the Independence property, shipped 34 tons of ore containing 0.15 ounce of gold and 36.4 ounces of silver to the ton, 10.4 per cent of lead, 12.5 per cent of zinc, and 1.8 per cent of sulphur. A 50-ton milling plant, equipped with a Marcy rod mill, classifier, and K. & K. flotation apparatus, was installed. The property is 15 miles northeast of Morristown, a station on the Sante Fe Railroad. Ore from the Golden Rule claim yielded a small lot of gold bullion.

YUMA COUNTY

The total value of the mine production of gold, silver, copper, and lead in Yuma County was $49,746 in 1925 against $51,831 in 1924. There were gains in gold and lead but declines in silver and copper. Twenty-one lode mines, 7 more than in 1924, produced 1,647 tons of ore. The placer output was $1,666 in gold and 9 ounces of silver.

Castle Dome district.—Eight lode mines in the Castle Dome district produced 438 tons of ore, yielding $2 in gold, 3,857 ounces of silver, 6 pounds of copper, and 215,626 pounds of lead, valued in all at $21,439, or $48.95 a ton. This output does not include $431 in gold and 2 ounces of silver produced by placer operators. Of the total ore 399 tons were milled, yielding 135 tons of concentrate containing silver and lead. First-class ore shipped to a smelter amounted to 39 tons.

The chief producers were the Sonora and New Deal properties. At the Sonora mine is a 10-ton mill with hand jigs and dry tables of the Stebbins type. Some lead ore was shipped from the Silver Dollar claim and from old dumps worked by lessees. The Castle Dome mines have produced almost continuously since 1869. The best estimate that can be made of the total production of the district to 1904 is $3,000,000, chiefly in lead and silver. A recent article[24] describes the geology of the district.

Cienega district.—The Empire Leasing Co. operated the Carnation group and shipped several cars of copper ore, containing gold and silver.

Ellsworth district.—For a short time there was considerable activity in the Ellsworth district. Lessees opened up the Bonanza, Golden Eagle, Critic, and Harqua Hala properties, from which copper ore and lead ore were shipped. The Copper Gem and Cuprite mines were also producers of copper ore. Oxidized lead ore was shipped from the Wonder claim, and siliceous gold ore from the B. B. group, 8 miles northwest of Wenden in the Harcuvar Mountains, was shipped to the smelter at Hayden. At the property of the Wenden Copper Mining Co. a new shaft was sunk, but no ore was shipped.

[24] Thompson, A. P., "Castle Dome lead district of Yuma County": Ariz. Min. Jour., July 15, 1925, p. 5.

Fortuna district.—The Elan Mining Co., prospecting the old Fortuna mine, operated a 5-stamp amalgamation plant from the middle of November, 1925, to March, 1926, and shipped some gold bullion.

Kofa district.—A lessee cleaned up a few ounces of gold bullion from an old mill at the North Star property.

Planet district (*Swansea*).—The Swansea mine, a large producer of copper as recently as 1923, was idle. Only a few tons of copper ore were shipped from the Planet mine.

Plomosa district.—Lessees shipped 65 tons of siliceous ore, yielding 4,140 ounces of silver and 3,800 pounds of lead, from the R. & A. claim, which is opened by an inclined shaft 100 feet deep. The placer output amounted to $1,099 in gold and 6 ounces of silver.

Santa Maria district.—Nine tons of ore from the East Side property was milled in Benard's custom concentrator, which is about 4 miles west of the mine. The concentrate contained 43 per cent of lead and 3.9 ounces of silver to the ton.

Seneca district.—The Sue mine, 6 miles from Parker, was worked by a lessee for a short time and produced 46 tons of copper ore yielding 12.78 ounces of gold and 5,400 pounds of copper.

RARE METALS

By Frank L. Hess [1]

COBALT

In 1925, as in a number of preceding years, the United States produced no cobalt and consumption was represented more or less closely by imports. During the last 10 years imports have been as follows:

Cobalt ore, cobalt, and oxide imported for consumption in the United States, 1916–1925

Year	Ore		Cobalt		Oxide		Total	
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
1916	(1)	(1)	136,770	$175,236	206,639	$192,009	343,409	$367,245
1917	(1)	(1)	223,794	369,950	276,406	275,821	500,200	645,771
1918	(1)	(1)	504,391	628,099	208,596	291,699	712,987	919,798
1919	17,045	$2,832	60,511	141,450	131,424	184,751	208,980	329,033
1920	13,039	4,794	143,603	326,864	202,724	399,605	[2] 359,586	[2] 731,277
1921	7,657	3,235	38,442	105,539	164,003	342,426	210,102	451,200
1922	5,195	7,075	126,364	321,396	217,530	435,895	[3] 349,089	[3] 764,366
1923	58,719	56,326	225,639	552,434	258,574	511,903	[3] 542,932	[3] 1,120,663
1924	28,783	37,276	118,952	264,935	226,703	440,898	[3] 374,441	[3] 743,109
1925	34,782	31,320	198,669	422,185	287,265	546,292	[3] 520,716	[3] 999,797

[1] Ore included with cobalt; not separately recorded until July, 1918. From July to December, 1918, imports are recorded as follows: Ore, 220,115 pounds, valued at $55,188; metal, 250,920 pounds, $498,316.
[2] Includes 220 pounds of zaffer, valued at $14. Imports of zaffer not separately recorded 1916 to 1918, and none imported 1919 and 1921 to 1925.
[3] Also 11 pounds of "other salts and compounds," valued at $26, imported Sept. 22 to Dec. 31, 1922. Not separately classified prior to new tariff. Similar additional imports in 1923 were 45,644 pounds, valued at $27,356; in 1924, 797 pounds, $856; and in 1925, 13,256 pounds, $7,894.

Cobalt compounds imported for consumption in the United States, 1923–1925

	1923		1924		1925	
	Pounds	Value	Pounds	Value	Pounds	Value
Linoleate	3,617	$1,140	40	$22	3,258	$1,196
Sulphate	39,691	24,597			9,780	5,951
Other salts	2,336	1,619	757	834	218	747
	45,644	27,356	797	856	13,256	7,894

[1] Figures on imports and exports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

Cobalt and cobalt ore imported into the United States, 1923–1925, by countries

[General imports]

Country	1923		1924		1925	
	Pounds	Value	Pounds	Value	Pounds	Value
Australia	38,772	$10,112	12,786	$12,709	21,952	$1,41
Belgium	278	66				
Canada	175,189	442,740	112,752	251,332	178,450	387,41
Germany	11	24			39	8
Jamaica					500	1,25
United Kingdom	70,108	155,818	22,200	38,170	9,310	19,88
	284,358	608,760	147,738	302,211	210,251	410,04

During the year the Belgian, Canadian, and British operators continued their close control of the supply and price of cobalt. The Belgian supply is obtained from veins carrying cobalt, copper and iron sulphides, near Elisabethville, Katanga, Belgian Congo. The Canadian supply is derived from cobalt arsenides and arsenosulphides accompanying silver in the veins of the Cobalt district, Ontario. Part of the British supply is mined from cobalt arsenosulphide veins in the Cloncurry district of Queensland, and the remainder is saved as a by-product from nickel ores mined near Sudbury, Ontario, and treated by the Mond process at Clydach, Wales.

The price was held throughout the year at about $2.50 per pound for the metal, $2.10 for the black oxide, and $2.25 to $2.35 for the gray oxide, lucrative figures that probably would be cut heavily should unexpected competition arise. The Belgian company's and possibly another company's supply could probably be sold with good profit at half the fixed price.

Like bismuth, cobalt is found in small quantities at many places and in large quantities at very few places.

The principal use of cobalt is in the making of stellite, the corrosion-resistant group of alloys made of cobalt and chromium to which tungsten and other metals are added to adapt the properties to particular needs. Magnet steel, tool steels, and corrosion-resistant steels take other quantities of metallic cobalt. Organic cobalt salts are used for driers in paint, and some cobalt is used as pigment in pottery and enamels.

WORLD'S PRODUCTION

The production of cobalt is given from the several producing countries in such indefinite figures that the estimates are not very exact, but from various official reports the following data have been compiled:

World's production of cobalt, 1924–25, in metric tons

Country	Cobalt-bearing material	1924		1925	
		Gross weight	Cobalt content	Gross weight	Cobalt content
Australia: Queensland	Cobaltite concentrates, etc.	200.4	[1] 60	91.4	[1] 27.4
Belgian Congo	Copper-iron-cobalt alloy	976	[1] 273	684	[1] 192
Canada: Ontario	Cobalt alloys and chemicals	(2)	209.2	(2)	246.1
Chile	Arseno-sulphide ore	34.6	2.1		
Germany: Saxony	Cobalt-bismuth-nickel ores	102	[1] 6	145	6.9
			550.3		472.4

[1] Estimated. The Belgian Congo alloy is said to carry 28 per cent of cobalt.
[2] Data not available.

It is possible that some other small quantities of cobalt ore should be added to the table, but they are probably insignificant.

MOLYBDENUM

The production of molybdenum in the United States during 1925 remained in the hands of two companies, the Climax Molybdenum Co., with a mine at Climax, Colo., and the Molybdenum Corporation of America, with a mine in Sulphur Gulch, 7 miles east of Questa, N. Mex. Together the companies produced 97,665 short tons of ore, from which were made 1,187 short tons of concentrates carrying 72.7 to 85 per cent of molybdenum sulphide and containing 1,154,050 pounds of molybdenum (metal).

The molybdenum deposit of the Climax Molybdenum Co. consists of a huge mass of highly brecciated and silicified igneous rocks, mostly quartz porphyry, through which are innumerable veinlets carrying tiny flakes of molybdenite. The deposit has been exposed to long weathering, with the result that about 25 per cent of the molybdenum occurs as molybdite (iron-molybdenum oxide, $2Fe_2O_3.6MoO_3.15H_2O$), a yellow powdery mineral that is difficult to save economically.

The property of the Molybdenum Corporation of America contains a number of narrow irregular veins following faults. The molybdenite was deposited with the veins which later were crushed by further movements of the faults. The ore, although mined in much smaller quantity than the Climax ore, is much richer.

Each company worked its mine throughout the year.

The production of molybdenum in the United States during the last 10 years has been as follows:

Molybdenum in ore and concentrates, produced in the United States, sold in 1916–1925

Year	Pounds	Value	Year	Pounds	Value
1916	206,740	$205,000	1921		
1917	350,200	495,350	1922		
1918	861,637	1,253,700	1923	22,667	(1)
1919	297,926	341,814	1924	297,174	(1)
1920	34,900	17,207	1925	1,154,050	[2] $450,080

[1] Not reported
[2] Estimate by Bureau of Mines; not reported by producers.

The fact that the two companies found the market for the metal good enough to justify running their mills throughout the year is in itself testimony that the use of molybdenum has increased largely.

This increase has been almost all if not wholly in machine and othe steels in which great toughness is desired. For this purpose 0.25 t 0.40 per cent of molybdenum is ordinarily employed.

The use of molybdenum in such steels is illustrated by the com positions given below, which were approved for adoption as "recom mended practice" by the iron and steel division of the Society o Automotive Engineers:[2]

Molybdenum steels, specifications recommended

S. A. E. steel No.	Carbon range	Manganese range	Phosphorus, maximum	Sulphur, maximum	Chromium range	Nickel range	Molybdenum rang
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
4130	0. 25–0. 35	0. 40–0. 70	0. 04	0. 045	0. 50–0. 80	----------	0. 15–0. 2
4140	.35– .45	.40– .70	.04	.045	.80–1. 10	----------	.15– .2
4150	.45– .55	.40– .70	.04	.045	.80–1. 10	----------	.15– .2
4615	.10– .20	.30– .50	.04	.045	----------	1. 25–1. 75	.20– .3

A really remarkable change in the manner of adding molybdenum to steel took place during the year. The Climax Molybdenum Co began selling its molybdenum in the form of calcium molybdate which was added to the bath and from that absorbed into the steel. The Molybdenum Corporation of America produced a compound said to be a calcium silico-molybdate, which was used in the same way. The use of ferromolybdenum and of molybdenum powder seems wholly to have ceased in this country except in tool steels.

The production of ferromolybdenum and calcium molybdate (including calcium silico-molybdate) in 1925 was 427,402 pounds containing 160,826 pounds of molybdenum, a content of 37.63 per cent.

The shipments of ferromolybdenum and the molybdates during 1925 amounted to 469,664 pounds containing 186,157 pounds of molybdenum. The average value at the furnaces was $1.27 per pound for the contained molybdenum.[3]

The price of molybdenite fell steadily during the year. As quoted for imported ores, it was 51 shillings 6 pence to 47 shillings 6 pence ($12.53 to $11.56) per long ton unit, 22.4 pounds of molybdenum sulphide (MoS_2), equivalent to $11.19 to $10.32 per short ton unit of 20 pounds of MoS_2.

IMPORTS

During 1925 the United States imported molybdenum ore containing less than a ton of molybdenum. The imports since 1918 are shown in the following table:

"Molybdenum ore[a] (steel-hardening)" imported for consumption in the United States, 1918–1925

Year	Pounds	Value	Year	Pounds	Value
1918, July to December[b]	140, 222	$123, 924	1922	412, 221	$90, 015
1919	106, 743	77, 572	1923[c]	16, 671	13, 115
1920	15, 639	9, 707	1924[c]	10, 379	9, 038
1921	29, 783	20, 471	1925[c]	1, 954	1, 793

[a] 1918–1922, recorded as molybdenum ore: 1923–1925, recorded as molybdenum content of ore.
[b] Not separately classified prior to July, 1918.
[c] Classification under new tariff in effect Sept. 22, 1922, "Molybdenum ore and concentrates (molybdenum content)."

[2] Journal of Society of Automotive Engineers, "Molybdenum steels approved": Vol. 16, April, 1925, p. 414.
[3] Figures compiled by H. W. Davis, of the Bureau of Mines.

Besides the molybdenum in ore, 274 pounds of molybdenum as metal and powder and in ferromolybdenum, valued at $1,184, were imported.

WORLD'S PRODUCTION

The accompanying table gives the world's production of molybdenum in 1925. The table has been compiled from available official reports.

World's production of molybdenum ores and concentrates in 1925

Country	Mineral	Ore	Concentrates	Per cent MoS_2	Contained molybdenum	Value
		Metric tons	*Metric tons*		*Metric tons*	
Austria	Wulfenite	(1)	[2] 12.6		8.4	(1)
Australia:						
New South Wales	Molybdenite	(1)	6	[3] 80	2.9	$8,020
Queensland	do	(1)	3	[3] 80	1.4	1,319
Victoria	do	1,175	35	84	17.6	26,989
Canada	do	(1)	14	72.65	6.6	11,176
Norway	do	(1)	146	[3] 80	70.1	(1)
United States	do	88,600	1,076.8	72.7–85	523.5	[4]450,080

[1] Data not available. [2] MoO_3 contained in ores. [3] Estimated.

NICKEL

As has been noted frequently, the United States possesses no nickel deposits of sufficient size and richness to compete with the deposits now worked in Ontario, and it probably could not produce enough nickel for its present use if the price were doubled.

The only nickel now produced in this country is a small quantity saved as nickel salts in the electrolytic refining of blister copper. The blister copper made from the sulphide ores carries minute quantities of nickel which accumulate in the electrolyte of the electrolytic refineries and are finally obtained from it as hydrous nickel sulphate ($NiSO_4.7H_2O$, known in the nickel-plating industry as "single salt") or hydrous nickel-ammonium sulphate ($NiSO_4.(NH_4)_2SO_4.6H_2O$, known as "double salt"). In 1925 only the sulphate was produced.

In 1925 three companies saved 2,604,229 pounds of sulphate containing a total of 272 short tons of nickel and valued at $169,664. The production of nickel during the last 10 years is shown in the accompanying table:

Nickel content of nickel salts and metallic nickel produced in the United States as a by-product in the electrolytic refining of copper, 1916–1925, and from mixed ores in 1919 and 1920

Year	Short tons	Value	Year	Short tons	Value
1916	918	$671,192	1921	111	$86,000
1917	402	331,556	1922	208	133,191
1918	441	401,000	1923	100	71,605
1919 [1]	511	434,485	1924	191	114,903
1920 [1]	365	293,250	1925	272	169,664

[1] Including nickel produced from copper-lead-cobalt-nickel ores mined in Missouri.

By far the largest quantity of nickel imported into the United State comes from the Sudbury region of Ontario, Canada. The Interna tional Nickel Co., the largest producer, mines its ore from the Creigh ton and Frood mines near Sudbury and reduces the ore to matte a Copper Cliff, Ontario, whence that part from which nickel and cop per is to be separated is sent to Port Colborne, also in Ontario, fo electrolytic refining, and the part from which Monel metal is to b made is sent to Huntington, W. Va. Monel metal is an alloy whicl contains approximately the same proportions of nickel and copper a the ore; it carries about 67 per cent of nickel, 28 per cent of copper and 5 per cent of manganese, iron, and impurities. No separatio of the nickel and copper is necessary, for the alloy has largely the valuable properties of nickel and can be made more cheaply than i separation were required. In the electrolytic refining of the matte at Port Colborne the gold, silver, and platinum metals in the ore are saved—a matter of some importance.

The Mond Nickel Co., represented in this country by the American Nickel Co. of Clearfield, Pa., mines its ore mostly from the Levack and Garson mines near Sudbury, smelts the ore to matte at Conis ton, Ontario, and ships the matte to Clydach, Wales, where the nickel is separated as a gas (nickel carbonyl), from which it is reduced in the form of pellets. As in the electrolytic process, the precious metals can be extracted, and cobalt is also saved; the products are handled by Wiggins & Co., a subsidiary at Liverpool. The saving of precious metals from nickel ores of the Sudbury region during 1925 is shown in the following table:[4]

Precious and rare metals extracted from Sudbury mattes in 1925

Metal	Troy ounces	Value
Gold	4,016	$82,437
Silver	134,390	92,682
Platinum	8,692	1,026,737
Palladium	7,856	608,727
Rhodium, Ruthenium, Osmium, Iridium	432	40,242
		1,850,825

This output would have been increased considerably had it been practicable to save the precious metals from the matte used for Monel metal.

The United States Nickel Co., at New Brunswick, N. J., imports from the parent company, the Société des Hauts-Fourneaux, nickel matte from the French island of New Caledonia in the South Pacific Ocean. Formerly the ores were matted in Belgium or France, but the matte is now made on the island.

The Sudbury ores are sulphides containing pentlandite, a nickel-iron sulphide [(NiFe)S]. The New Caledonia ores are hydrous nickel magnesium silicates known as garnierite, a variety of genthite. In the smelting of the New Caledonia ores sulphur must be introduced, as such or in gypsum, to form a matte.

The imports and exports of nickel and nickel-bearing materials during the last 10 years are shown in the following table:

[4] Gibson, Thomas W., "Nickel": Mineral Industry, 1925, p. 508.

Nickel imported for consumption in the United States, 1916–1925

Year	Nickel, nickel ore and matte, nickel oxide, and alloys of nickel with copper, etc.		Manufactures and nickel sheets and strips	Total value
	Pounds	Value		
1916	72,649,377	$9,899,340	$25,880	$9,925,220
1917	75,526,767	9,617,163	45,248	9,662,411
1918	73,207,147	11,520,826	115,243	11,636,069
1919	36,565,462	8,331,564	90,451	8,425,015
1920	48,492,270	10,657,523	200,464	10,857,987
1921	4,400,453	1,220,347	107,155	1,327,502
1922	14,919,408	3,945,309	110,176	4,055,485
1923	40,670,189	6,602,096	94,832	6,696,928
1924	36,918,980	6,132,984	70,755	6,203,739
1925	43,071,073	7,772,320	98,761	7,871,081

Nickel imported for consumption in the United States, 1923–1925, by classes

Class	1923		1924		1925	
	Pounds	Value	Pounds	Value	Pounds	Value
Unmanufactured:						
Nickel ore and matte (nickel content)	14,601,820	$1,145,645	11,333,251	$1,063,084	9,912,145	$1,062,844
Nickel alloys, pigs, bars, etc.	23,783,041	5,159,888	24,683,882	4,949,655	31,876,710	6,532,495
Nickel oxide	2,284,342	296,462	901,847	120,245	1,282,218	176,981
Nickel or German silver	986	101				
Manufactured:						
Nickel or German silver in sheets, strips, and rods	5,064	1,855	20,113	4,548	7,565	4,369
All other manufactures of nickel	127,324	92,977	145,785	66,207	123,681	94,392
	40,802,577	6,696,928	37,084,878	6,203,739	43,202,319	7,871,081

Nickel, nickel oxide, and matte[1] exported from the United States, 1916–1925

Year	Pounds	Value	Year	Pounds	Value
1916	33,404,011	$12,952,493	1921	425,851	$103,372
1917	21,992,820	8,936,620	1922	9,317,520	1,016,091
1918	17,469,500	6,927,041	1923[1]	11,200	626
1919	3,810,656	1,697,544	1924[1]		
1920	1,215,232	574,845	1925[1]		

[1] Nickel oxide and matte only after 1922. Separate figures for nickel not available. See following table.

Nickel exported from the United States, 1923–1925, by classes

Class	1923		1924		1925	
	Pounds	Value	Pounds	Value	Pounds	Value
Oxide and matte	11,200	$626				
Nickel	868,158	307,269	1,915,456	$565,911	2,569,185	$834,529
Monel metal and other alloys						
Manufactures	488,088	290,452	446,183	203,854	529,906	360,628
Nickel or German silver in bars, rods, or sheets	481,178	145,518	250,769	73,372	492,964	135,906

In the manufacture of vessels for holding foods, such as large cal drons and smaller pots and pans and cafeteria and dairy utensils in various alloys for resistance to heat, steam, weathering, and chem icals; in brass, cast iron, and steel; and for other purposes, the us of nickel has grown greatly, partly through research, advertising and salesmanship by the companies selling nickel, and partly throug the search for resistant alloys by users.

In 1919 the use of nickel was reported by the International Nickel Co. to be about as follows:

	Per cen
Nickel steel (largely armor plate)	6(
White metals	3(
Anodes	
Miscellaneous	

Since then the use has changed and is now about as follows:

	Per cen
Nickel steel (little of which is armor plate)	37
White metals	17
Anodes	2
Miscellaneous (including alloys)	2

During 1925 the price of nickel averaged about 34 cents per pound.

According to figures collected by John P. Dunlop, the production of secondary nickel—that is, nickel recovered after being used—has been as follows during the last five years:

Secondary nickel recovered as metal and in nonferrous alloys and salts in the United States, 1921–1925, in short tons

Year	Nickel recovered			Year	Nickel recovered		
	As metal	In nonferrous alloys and salts	Total		As metal	In nonferrous alloys and salts	Total
1921	86	859	945	1924	114	2,126	2,240
1922	104	1,408	1,512	1925	191	2,109	2,300
1923	177	1,373	1,550				

The Bureau of Mines frequently receives inquiries for the names of buyers of nickel ores. The companies now producing nickel have such huge supplies of ore, such well-established businesses, and such large amounts of capital invested that they can readily take care of the world's demand. They do not need to buy ores, and the use of other ores might mean an uneconomical change in practice. Therefore they do not buy. Other such great supplies of ore are not available; consequently other companies can not compete and there is at present no market for nickel ores. It is conceivable, however, that some smelter treating sulphide copper ores carrying a little nickel, which is saved, might care to add nickel-copper ores to its furnace charge, but no such company is known.

The world's production of nickel in 1925, as gathered from official reports, is shown in the table following:

World's production of nickel in 1925, in metric tons

Country	Ore		Matte	
	Total	Nickel content	Total	Nickel content
Canada	[1] 1,142,002	[2]	63,757	[3] 33,462
Germany: Saxony	[4] 145			
Italy	200	6		
New Caledonia	86,550	5,409	4,820	3,711
United States			[5] 1,181	247

[1] Ore smelted.
[2] Data not available.
[3] Includes 263 tons of nickel contained in cobalt ore.
[4] Cobalt-bismuth-nickel ore.
[5] Hydrous nickel sulphate.

TITANIUM

During 1925, 46 short tons of rutile, carrying about 95 per cent of titanium dioxide (TiO_2), and 5,566 short tons of ilmenite (iron-titanium oxide, $FeTiO_3$), carrying about 52 per cent of TiO_2, were shipped from Pablo Beach, Fla. The minerals were concentrated from the beach sand about 4 miles south of Pablo Beach by Buckman & Pritchard (Inc.), a subsidiary of the National Lead Co. In addition, 624 short tons of zircon and 1 ton of monazite, which were obtained as by-products of the ilmenite, were shipped. The plant of the American Rutile Co., at Roseland, Nelson County, Va., was not operated during the year.

The production of titanium minerals in this country during the last 10 years is shown in the following table:

Titanium minerals produced in the United States, 1916–1925

Year	Rutile concentrates		Ilmenite concentrates		Value
	Short tons	Percentage of TiO_2	Short tons	Percentage of TiO_2	
1916	110	95	95	55	$18,460
1917	206	93	1,339	53–55	45,637
1918	261	95	1,644	53–55	57,750
1919 [1]	102	94–96	106	48–50	22,520
1920	277	94–96	268	50	[2]
1921					
1922	310	95	5,181	52–54	[2]
1923	270	95	6,270	52	[2]
1924			4,769	52	[3] 76,300
1925	46	95	5,566	52	[3] 100,000

[1] Virginia production only; information regarding Florida not available for publication.
[2] Bureau of Mines not at liberty to publish values.
[3] Arbitrary value.

The largest use for titanium minerals is one that would probably have been least suspected before it became a fact—the making of white pigments from the black iron-rich mineral, ilmenite. During the last few years this use has grown until it is now by far the largest use for titanium and promises to be much larger. At first thought, the resources of ilmenite available for this use may seem almost unlimited, but most of the known ilmenite-bearing deposits, such as those of the Adirondacks in New York, Iron Mountain, Wyoming, and others, carry only 8 to 16 per cent TiO_2, and for use in pigments the content of titanium oxide, which at best is only about

52.7 per cent, must be as large as possible, otherwise the cost of removing the iron becomes prohibitive.

So far as is known, the only original ilmenite-bearing deposits—that is, deposits in the rock where they were first formed as distinguished from those that have been concentrated through water action of some kind—that are high enough in titanium, are sufficiently large to warrant exploitation, and are conveniently enough situated for use are the Blaafjeldet and Laxedals deposits in Sogndal, near Egersund, Norway. Only the Blaafjeldet deposit, which carries 40 to 45 per cent TiO_2, is now worked. The Laxedals deposit carries about 35 per cent TiO_2.

On sea beaches in various places in the world, however, ilmenite has been concentrated by wave action into deposits that may readily be reconcentrated artificially to comparatively pure ilmenite. The known deposits are on beaches receiving the wash from gneissoid rocks throughout which ilmenite is distributed in small masses. Through weathering and battering while being transported by streams and waves the masses are broken to small worn grains which are mixed with those of other heavy and hard minerals common to the gneisses, such as quartz, garnet, andalusite, magnetite, rutile, zircon, and monazite. Magnetite, although a common constituent of gneisses and other crystalline rocks, does not form a large part of the concentrates on the old beaches which are workable for ilmenite, probably because it is more or less cleavable and therefore breaks up more readily than the noncleavable ilmenite. On geologically young beaches, such as those scrubbed off by the glaciers of the glacial epoch or those bordering land recently elevated, the known deposits of heavy sands contain a large percentage of magnetite. Magnetite is readily removed with a magnetic separator.

The best of the known ilmenite-bearing beaches are those of northern Florida, on the Atlantic; Espirito Santo, Brazil; Senegal; and Travancore, on the southwest coast of India. In Brazil and Travancore a large proportion of monazite is mixed with the natural concentrates, in Florida a very small proportion, but all carry considerable zircon.

Many patents have been issued covering the making of pigments from ilmenite. The first company to make pigments from the mineral was A/S. Titania,[5] which has a factory at Frederikstad, Norway. By its process the ilmenite is pulverized and mixed with concentrated sulphuric acid; heated; dissolved in water; undecomposed particles are settled out; and the ferric iron compounds are reduced by electrolysis to ferrous compounds. The solution is then boiled, and the titanium is precipitated as hydrous oxides, which are washed and mixed with barium carbonate. The final product, which contains several titanium compounds and barium sulphate, is mixed with zinc white and oil.

In America the industry was started by the Titanium Pigment Co. of Niagara Falls. Later the National Lead Co. acquired control and a new plant was erected at St. Louis. The process used is covered by many patents. Roughly the process is:[6] The ilmenite, with "niter cake" (essentially sodium bisulphate formed in making nitric acid

[5] Jebsen, G. A. [The Norwegian titanium-white industry]: Tek. Ukeblad, vol. 67, Apr. 23, 1920, pp. 234–240.

[6] Thornton, W. H., Titanium: Am. Chem. Soc. Monograph. (In press.)

from sodium nitrate) and coke, is fused in an electric furnace; the melt is poured into molds in which a gravity separation takes place; sodium-iron sulphide forms the crust and sodium titanate the lower part of the mass in the mold. The mass is crushed and hand picked, the lower part is lixiviated, and the residue is treated with boiling dilute sulphuric acid to remove impurities. Undissolved matter is then treated with concentrated sulphuric acid, water is added, and the solution is filtered. A small part of the solution is partly deoxidized electrically and returned to the main body of liquid to reduce the ferric iron to ferrous iron. Finely divided barium sulphate is added to the solution, the solution is heated and agitated, and the titanium as basic sulphate and oxide is precipitated on the barium sulphate. The precipitate is then filtered out and calcined.

The pigment contains about 25 per cent titanium oxide and 75 per cent barium sulphate, but before use it is mixed with three times its weight of zinc pigments.[7]

In Germany one company, the Deutsch Gasglühlicht, g. m. b. H., of Berlin, makes titanium pigment in white and various colors.

The other uses of titanium are small. Some ferrotitanium is made for use in steel, some potassium-titanium oxalate for use in leather tanning and dyeing, and some sulphate for use in dyeing textiles. In addition rutile is used in certain arc-lamp electrodes and in enamels and glasses. A small quantity of titanium tetrachloride for making military smoke screens is manufactured from rutile.

The world's production of titanium minerals in 1925, according to the data obtainable from official statistics, is shown in the following table:

World's production of titanium minerals in 1925

Country	Mineral	Metric tons	Content of TiO_2	
			Per cent	Metric tons
Brazil	Ilmenite	1,500	53	795
Canada: Quebec	do	3,609	[1] 35	1,263
India	do	332	52	173
Norway	do	4,162	41	1,706
	Rutile	52	92	48
Portugal	Ilmenite	3	[1] 50	2
Senegal	do	181	48	87
United States	do	5,049	52	2,625
	Rutile	42	95	40
		14,930	45	6,739

[1] Estimated.

The price of rutile (92 to 95 per cent TiO_2) during the year was 10 to 15 cents a pound. Prices of ilmenite concentrates were a matter of bargaining, and no market price could be said to exist, but what buying and selling took place was probably at prices between $10 and $20 per short ton for material carrying 50 to 52 per cent TiO_2.

Imports of titanium-bearing materials in 1925 were: Ferrotitanium, 38,280 pounds, valued at $6,698, and titanium-potassium oxalate, 81,721 pounds, valued at $12,368.

[7] U. S. Bureau of Standards, U. S. Government Master Specification for Outside White Titanium-Zinc Paint, Semipaste and Ready-Mixed: Circular 215, 1925.

TUNGSTEN

The rise in production of tungsten ores, the beginning of which was evident when 374 short tons of concentrates carrying 60 per cent tungstic acid (WO_3) were produced in the United States in 1924, continued through 1925, resulting in a production of about 1,191 tons. All was scheelite except the ferberite from Boulder County, Colo., and a few tons of huebnerite and wolframite from the Hillside and Arivaca districts in Arizona.

Concentrated tungsten ores (reduced to equivalent of 60 per cent WO_3) produced in the United States, sold in 1916–1925, and average price per unit

Year	Short tons	Value	Average price per unit	Year	Short tons	Value	Average price per unit
1916	5,923	$12,074,000	$33.98	1921			
1917	6,144	6,783,000	18.40	1922			
1918	5,061	7,049,300	23.24	1923	241	$144,600	[1] $10.00
1919	327	353,900	18.02	1924	[2] 565	[2] 287,000	8.47
1920	216	101,800	7.86	1925	1,191	755,500	10.57

[1] The output of 1923 was made by one company only, which sold to its owners at a price considerably above the market.
[2] Includes 191 tons produced in 1919, sold in 1924 for $87,000.

At Atolia, Calif., throughout 1925, the Atolia Mining Co. mined only through lessees as it has since it reopened its famous mine. The ore is said to have carried about 7 per cent WO_3. At Bishop, Calif., the Tungsten Products Co. pushed it's work actively. The ore is tactite (contact metamorphic material) of low grade; it occurs at an altitude of 11,000 feet in a country of heavy snows and is reached over a difficult trail. It carries copper, which must be separated from the concentrates, so that careful operation is necessary if a profit is to be shown. Although in California, the deposit is areally and in its geological characteristics allied to the Nevada group of tactite deposits.

In Nevada in 1925 the American Tungsten Co. made a small output from tactite in the Pilot Range, 23 miles southeast of Mina, as did the Pacific Smelting & Metals Corporation, on the east side of the Nightingale Range, 50 miles northwest of Lovelock, and C. W. Poole and the Nevada-Massachusetts Co. (Inc.), in the Eugene Mountains, 12 miles north of Mina. C. W. Poole concentrated scheelite from the tailings of the St. Anthony Mining Co.'s mill at Toy, where tactite ore was worked during the period from 1915 to 1918, and also produced scheelite from the Silver Dyke vein, near Mina.

In Boulder County, Colo., the Wolf Tongue Mining Co. made a small production of ferberite in 1925 and bought the output of other operators and of lessees. Altogether, the output amounted to an equivalent of only 201 tons of 60 per cent concentrates. Much of the output carried only 55 per cent tungstic acid (WO_3).

In Arizona the Hummel Wilson Tungsten Co. began operating a new 25-ton mill near Arivaca on huebnerite, and a little scheelite and wolframite was produced by others.

In the Black Hills of South Dakota the Homestake Mining Co. made arrangements to begin mining wolframite again, and prospectors took a lease on the old Wasp No. 2 property.

WORLD'S PRODUCTION

The world's production of tungsten, as shown by the ores shipped or marketed, from 1916 to 1925, so far as statistics are available, is shown in the following table compiled by L. M. Jones, of the Bureau of Mines, from official reports.

World's production (as shown by sales or exports) of tungsten ore, 1916–1925, by metallogenic provinces and political areas, in metric tons of concentrates containing 60 per cent of WO_3

Province and area	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925
ASIA										
Japo-Korean province:										
Japan	730	763	629	574	170					
Chosen (Korea)	555	919	1,100	197	5	(2)	14	(1)	(1)	(1)
Chino-Malayan province:										
China	109	1,361	10,577	2,654	4,712	2,657	3,873	4,554	3,398	6,708
Tonkin (Indo-China)	343	433	378	284	284	452	112	129	150	189
Burma and Shan States	3,464	4,226	4,138	3,623	2,983	673	1,038	960	814	849
Siam	530	726	231	258	137	76		(2)		
Unfederated Malay States	317	334	1,156	808	296	12	258	393	214	251
Federated Malay States	567	837	391	480	257	60	104	41	107	174
Dutch East Indies	47	8	7		161			10	165	(1)
Indian province: India (excluding Burma)	46	68	44	1						
	6,708	9,675	18,651	8,879	9,005	3,930	5,399	6,087	4,848	8,171
AUSTRALIA										
Australian province:										
Queensland	519	471	357	344	119	5	4		1	5
Northern Territory	137	252	280	278	245		19			
New South Wales	313	268	279	237	39			2	10	8
Victoria	17	28	5	3	9					
South Australia	(2)	(2)								
Tasmania	126	286	440	379	209	12	21	116	64	207
Western Australia	5	1	6	8	3					
	1,117	1,306	1,367	1,249	624	17	44	118	75	220
OCEANIA										
Oceanic province: New Zealand	306	235	170	146	47	46		6	4	2
SOUTH AMERICA										
Cordilleran province:										
Chile	2									
Argentina	854	1,085	614	204	182	52	125	144	137	1
Bolivia	3,288	4,215	3,703	2,161	766	174	9		(3)	82
Peru	532	427	256	139	77	2				5
Brazilian province: Brazil	5	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
	4,681	5,727	4,573	2,504	1,025	228	134	144	137	91
NORTH AMERICA										
Southwest American province:										
Mexico	159	308	239	103	82	37				
United States	5,330	5,545	4,578	297	196			219	513	1,080
Alaskan province: Alaska	43	29	13							
Canadian province: Southeastern Canada	(1)	(1)	15							
	5,532	5,882	4,845	400	278	37		219	513	1,080
EUROPE										
Scandinavian province:										
Norway	1	1	2							
Sweden			3	30	5					
Franco-Cornish province:										
England	407	255	307	177	83	81	3	2	2	1
France	162	261	45	70	23					(3)

[1] Data not available.
[2] Less than one-fourth ton.
[3] Less than one half ton.

World's production (as shown by sales or exports) of tungsten ore, 1916–1925, by metallogenic provinces and political areas, in metric tons of concentrates containing 60 per cent of WO_3—Continued

Province and area	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925
EUROPE—continued										
Iberian province:										
Portugal	1,418	1,580	1,150	706	237	306	527	289	304	207
Spain	425	446	534	302	57	25	-------	9	161	26
Italy	5	1	(1)	(1)	(1)	7	-------	1	-------	-------
Erzgebirge province:										
Germany	115	295	196	145	45	27	42	40	13	161
Austria	51	(4)	(1)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Czechoslovakia	(5)	(6)	(6)	70	48	35	28	28	66	(1)
Russian province: Russia	34	104	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
	2,618	2,943	2,237	1,500	498	481	600	369	546	395
AFRICA										
South African province:										
Southern Rhodesia	2	11	37	20	17	17	44	-------	22	22
Union of South Africa	2	18	37	9	-------	-------	-------	-------	-------	-------
Nigeria	(1)	(1)	(1)	32	(1)	(1)	(1)	(1)	(1)	(1)
	4	29	74	61	17	17	44	-------	22	22
	20,966	25,797	31,917	14,739	11,494	4,756	6,221	6,943	6,145	9,981

[1] Data not available.
[4] 93,136 tons of ore reported mined; WO_3 content not known.
[5] See under Czechoslovakia.
[6] Included under Austria.

Tungsten ore, ferrotungsten and tungsten metal, tungsten alloys, and tungsten chemicals imported for consumption in the United States, 1919–1925 [1]

Year	Tungsten ore and concentrates [1]		Tungsten and ferrotungsten, tungsten chemicals, powder, and acid [1]		Ferrochromium-tungsten, chromium-tungsten, chromium-cobalt-tungsten (W content)		Tungsten-nickel and other alloys of tungsten (W content)	
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
1919	18,816,000	$6,261,190	396,460	$287,981	-------	-------	-------	-------
1920	3,897,600	779,593	1,997,719	1,180,829	-------	-------	-------	-------
1921	3,227,840	276,757	507,206	180,371	-------	-------	-------	-------
1922:								
Jan. 1–Sept. 21	3,301,760	279,190	1,037,069	380,732	-------	-------	-------	-------
Sept. 22–Dec. 31	-------	-------	30,876	13,254	-------	-------	885	$741
1923	-------	-------	78,972	25,907	-------	-------	49	2,258
1924	-------	-------	132,987	46,156	8,800	$2,702	71	536
1925	854,059	206,326	839,194	316,454	396	352	-------	-------

[1] Prior to Sept. 22, 1922, imports recorded as ore, alloys, etc.; beginning with new tariff, recorded as tungsten content of ore, alloys, etc.

Considerable ore was held in stock at the beginning of the year, but by December less than 1,000 tons were visible on the domestic market.

Prices in 1925 ranged rather regularly from $9 per short ton unit (20 pounds of WO_3), duty ($7.14) paid, for good Chinese wolframite in January to $12 in December. Scheelite was held at 50 cents to $1 higher, powder or ferro at 90 cents to $1.15 a pound for the contained tungsten in this country, and at 25 cents to 35 cents abroad, although British quotations nominally ranged from 24 cents to 42 cents for the contained tungsten in ferro.

RADIUM, URANIUM, AND VANADIUM

GENERAL SITUATION

To American producers of radium ores (in this country no ores are mined for uranium itself) the chapter for 1925 is short and discouraging. For producers of vanadium ores there was some cheer, even though the year was one of struggle. During the year a total of about 13,070 short tons of uranium-vanadium ores was mined, containing about 33,800 pounds of uranium oxide (U_3O_8) and 771,700 pounds of vanadium pentoxide (V_2O_5). The ores are arbitrarily valued at $331,000.

The world's markets for radium were dominated even more completely than before by the Belgian production from Katanga ores. The world's markets for vanadium were perhaps still dominated by the Vanadium Corporation of America in a business way, but the production of vanadium ores increased so greatly that the corporation's shipments from Peru contained only about 25 per cent of the world's production, and British Southwest Africa became, for the time at least, the largest producer of vanadium ore.

RADIUM AND URANIUM

United States.—In the United States, the United States Radium Corporation alone isolated radium and that for only part of the year. Little mining was done, but W. J. Lewis and associates extracted some high-grade carnotite ore from the claims formerly worked by the Radium Co. of Colorado, on the plateau 1,000 feet above and 5 or 6 miles south of Gateway, Colo. This ore ran as high as 6 per cent U_3O_8 and 8 per cent V_2O_5. A little high-grade ore was mined by the Yellow Circle Mining Co., in the La Sal Mountains, about 16 miles east of Moab, Utah. As is well known, the radium in the carnotite is, in general, in equilibrium, and consequently the carnotite carries about 2.566 milligrams of radium per short ton for each per cent of U_3O_8.

Lean carnotite deposits, in tuffs (volcanic ash), were discovered and prospected by Milton Ray near Aguila, Maricopa County, Ariz., but so far are of only mineralogical interest.[8] The origin of the mineral is uncertain.

The effort to induce Congress to relieve the carnotite miners from annual assessment work, at least for a short period, was repeated but was again unsuccessful. Representative George F. Brumm introduced such a bill (H. J. Res. 95) December 21, 1925, but it was not acted upon.

Vanadium salts were produced as a by-product in radium manufacture, but no uranium salts were made.

During the year the United States imported for consumption oxide and salts of uranium to the amount of 19,290 pounds, valued at $18,553, and radium salts, 143 grains (9.27 grams), valued at $462,095. There was also imported 0.1771 grain (11.5 milligrams) of "bromide of mesothorium and radiothorium," valued at $203.

Belgium.—The radium plant of the Société générale métallurgique de Hoboken, at Oolen, Belgium, is said to have been in operation

[8] Hewett, D. F., Carnotite discovered near Aguila, Ariz.: Eng. and Min. Jour.-Press, vol 120, p 19, 1925

until July 24, 1925; by that time the company had worked up all of the ore on hand, and no more was imported. The total quantity of ore treated is said to have been about 1,500 metric tons, most of which carried 45 per cent U_3O_8. If only the lower limit were obtained, the ore would carry about 190 grams of radium. A rumored extraction of 180 grams therefore seems a possibility. The company gives out no figures, so that estimates of production vary widely. It is known that 3,856 metric tons of ore were mined in Katanga during 1923 and that previously several hundred tons had been shipped to Belgium. One member of the firm reported that 10 to 20 tons of ore yielded 1 gram of radium—an average of 15 tons to the gram.[9] This would mean either that the ore carried only about 26 per cent U_3O_8 or that the extraction was very low, neither of which alternatives seems probable.

The company reported isolating 2.7 grams of radium in 1922.[10] In 1923, 48 grams were isolated.[11] For 1924 and 1925 the company's reports merely state that 22 and 20 grams, respectively, were marketed.

The rate of isolation is said to have been doubled in 1925 and to have been continued until the works closed; by then the stock accumulated was so large that there could be no chance of disposing of it for a considerable time. The quantity on hand is unknown, but estimates range from 50 to 134 grams. The price is given as $70 per milligram.

Reserves in Africa are said to contain many times as much radium as has been produced.

Czechoslovakia.—Mining of radium ores at Jachymov (St. Joachimsthal) continued in spite of the difficult market. The Werner, Svornost, and Shaft, of the Saxon Nobility mines, were worked at depths of 120 to 150 meters,[12] and 1.2 grams of radium were isolated.[13]

The production since 1920 has been as follows:

	Grams		Grams
1920	2. 257	1923	1. 521
1921	3. 221	1924	1. 433
1922	2. 256	1925	1. 200

A few years ago 1.6 grams were sent to an English company, which was to use it for therapeutic purposes. The company failed, and the radium was deposited with the Czechoslovakian legation in London.

The Government has sold some radium, but the remainder has been rented to physicians at 10 per cent interest or deposited in the Government's Banking Office at the same rate.

There are 30 plants in Jachymov for making uranium pigments, mostly for glass and pottery coloring.

France.—Two radium companies operated in France during the year—that of Armet de l'Isle, at Nogent-sur-Marne, founded in 1904, and that of Dr. Henri de Rothschild, on Isle de Saint Denis. Both plants treat betafite (a columbate, tantalate, and titanate of uranium and rare earths) from Madagascar. Like other plants, they have found difficulty in meeting Belgian competition.

---

[9] Letter, Allport, F. W., May 2, 1925.
[10] Leemans, P. J., Communications faites en presence de S. M. le Roi, a la manifestation coloniale de Tervueren, Nov. 13, 1922, pp. 13-21.
[11] Williams, H. O., American consul. Information obtained from the Belgian Government.
[12] London Times, Dec, 14, 1925.
[13] Angel, J. K., American vice consul, Prague.

Portugal.—Some work was done in the Maceira-Guarda region, and a brecciated ore carrying a black substance, probably pitchblende, thinly coating the faces of the rock, was produced. On some specimens the coating is so thin that they appear to have been smoked. A little of the ore is said to have carried as much as 16 per cent U_3O_8, but most of it is reported to have carried about 1 per cent.

In 1924, according to an official communication, 367 metric tons of uranium ore carrying 1 per cent U_3O_8 and 1 ton of concentrates (uranium content not given) were exported from Portugal. The quantity exported in 1925 is not known.

Russia.—During the year further explorations of the tyuyamunite (calcium carnotite) deposits in the Alai Mountains, Ferghana, Russian Turkestan, were prosecuted by Dr. A. E. Fersman and associates, and new bodies of ore were found. A description of the Ferghana uranium and associated minerals with respect to their mineralogy, chemistry, and geology, by Doctor Fersman, was in press in early 1926. Westward, S. M. Kurbatov[14] found uranium-vanadium minerals in small quantity on the right bank of Bolshaya Erba River, 2 miles south of the village of Potekhino in the Minusinsk district of the Yenisei Government.

Doctor Fersman,[15] A. Labunzov,[16] and their parties searched for radioactive minerals in Carelia (on the Arctic coast, east of Sweden), and found uraninite in several pegmatites. The total is probably small and scattered, as in the pegmatites of Canada, the Uru-Guru Mountains of Tanganyika Territory, Africa, and various places in the United States.

The Government plant has isolated some radium from Ferghana ores.

South Australia.—Considerable interest was shown in the uranium deposits at Mount Painter, in the Northern Flinders Ranges, 88 miles north of Copley on the Great Northern Railway, and at Olary, 12 miles from Cutana Siding and 50 miles from Broken Hill. Four companies—the Radium & Rare Earths Treatment Co., the Mount Painter Heights Radium Syndicate (Ltd.), the United Mount Painter Radium Co., N. L., and the Mount Painter Exploration Radium Co., N. L.—have done more or less work on the deposits. The country is excessively dry, and camels[17] are used to carry ore and supplies from and to Mount Painter, 10 miles from the edge of the foothills. Autotrucks cover the remaining 78 miles to the railway at Copley, whence the distance to Adelaide is 375 miles. The Radium & Rare Earths Treatment Co. progressed far enough to extract 11 milligrams of radium from 2½ tons of crude ore that had been lying on the dumps for 12 years. An extraction plant was established at Dry Creek Station, 4 miles from Adelaide. At Mount Painter davidite (a titanium-iron mineral carrying some rare earths and uranium) and also minerals that result from weathering (carnotite, torbernite, and autunite) are mined. The ores apparently carry 1 to 2 per cent U_3O_8. It is proposed to manufacture titanium pigment from the residues. The ores at Olary are all oxidized.

---

[14] Kurbatov, S. M., New Deposits of Combined Uranium and Vanadium in the Minusinsk District of the Yenisei Government: Acad. Sci. Bull. 19, pp. 315–322, Leningrad, 1925. (In Russian.)

[15] Fersman, A. E., and Labunzov, A., "Report of the expedition to the uranium deposits in Russian Carelia": Compt. rend. Acad. Sci. Russia, 1925. (In Russian.)

[16] Labunzov, A., "Deposits of uranium minerals in the Carelian Republic": Compt. rend. Acad. Sci. Russia, 1925. (In Russian.)

[17] Broughton, A. C., "Wonders of Central Australia": Aust. Min. Stand., vol. 75, 1926, pp. 37–38.

USES

No new uses for uranium or radium have been brought to notice. Some uranium has been used in giving a yellowish tint to building tiles, a little in coloring pottery glazes and glass, and still less in chemicals. The Standard Chemical Co. did considerable experimental work in an effort to develop commercial uses for uranium.

Radium is used as before in the treatment of malignant and benign tumors, lupus, and some forms of cancer. The uses of radium in medicine have been summarized by Beclere [18] as follows:

> Radium is not a panacea, applicable to all cancers and capable of curing a cancer at any stage of its growth. Only under certain conditions it is an excellent weapon. Its applications, however, increase as the very delicate technique of its use is improved.
>
> For quite a while the knife has given place to X rays, and for a somewhat shorter time to radium, in the treatment of superficial cancers, especially of the face and lips. It is only during the recent years that, in the case of deeper-seated and more rapidly destructive cancers, much more difficult to treat, radium, aided by improved technique, has competed successfully with the knife. Such are the cancers of the tongue, of the mouth, of the throat, of the larynx, and of the womb.
>
> With the last-mentioned series of cancers, in cases where operations are not possible, radium, well managed, gives not only wonderful improvement, alleviation of suffering, and the prolongation of life, but also in a very goodly number of instances permanent cures. Even in cases where operations are possible, according to the most recent and convincing observations, cures by radium equal or surpass those with the knife.

A distressing occupational disease, termed "radium (mesothorium) necrosis," which is connected with the handling of radio-luminous paint came to public notice during the year.[19] At least five young women workers died, and a number of others were seriously affected. In an establishment where the young women were applying luminous paint consisting of zinc sulphide with small quantities of copper, manganese, lead, arsenic, thallium, uranium, selenium, mesothorium, and radium, the employees formed the habit of drawing the brush between the lips so as to make a better point. Diseases of the teeth and gums developed and were followed by decay of the jawbone and pernicious anemia. As some hundreds of persons handle luminous materials for watch and clock faces and other purposes in the United States, the disease is of some importance. It seems probable that the young women contracted the disease through the habit of putting the brush in the mouth. However, the deaths of two chemists connected with the same plant were also attributed to the handling of radioactive substances. One had been drinking large quantities of water that had been in contact with radioactive substances.[20] It is worth noting that Martland, Conlon, and Knef have come to the conclusion that "the intravenous injections of long-lived radioactive elements and the internal administration of radium, mesothorium, or radiothorium are highly dangerous on account of the late harmful effects. * * * The value of radium waters is questionable, since most of them at the time they are drunk have little or no radioactivity. Should

[18] Beclere, Antoine, "The use of radium in medicine": Rev. Scientif., Feb. 9, 1924. Reprint, Smithsonian Rept. for 1924–25, pp. 207–211.

[19] Hoffman, F. L., "Radium (mesothorium) necrosis": Am. Med. Assoc. Jour., vol. 85, Sept. 26, 1925, pp. 961–965. Martland, H. S., Conlon, Philip, and Knef, J. P., "Some unrecognized dangers in the use and handling of radioactive substances": Am. Med. Assoc. Jour., vol. 85, Dec. 25, 1925, pp. 1769–1776.

[20] Chemical Metallurgical Engineering, "Radium poisoning regarded as new occupational disease": Vol. 32, p. 654, July, 1925.

the waters contain radium or mesothorium in solution, their use would be distinctly dangerous on account of the later cumulative effects.[21]

A number of scientific workers handling comparatively large quantities of radium (5 grams or more) in other plants have been severely burned.

VANADIUM

United States.—The United States Vanadium Co. continued exploitation of the roscoelite-bearing sandstone deposits on East Rifle Creek, 11 miles northeast of Rifle, Colo. The deposit is said to reach a thickness of 23 feet. The ore is hauled to Rifle for extraction of vanadium oxide. Part of the oxide was manufactured into ferrovanadium at a plant bought by the company at Columbiana, Ohio, and part was shipped to Europe.

The Utah Vanadium Co., allied with the Pittsburgh Radium Co., mined vanadium-carnotite ores on Yellow Cat Wash, about 15 miles east and a little south of Thompsons, Utah. The ore was shipped to the company's plant at Denver for reduction to oxide. The oxide carried as much as 89.1 per cent V_2O_5 and was sold to eastern metallurgical firms for reduction to ferrovanadium. The only other known producer of vanadium from American ores was the United States Radium Corporation, which made a quantity of vanadium oxide as a by-product in the isolation of radium from carnotite ore mined in Colorado.

The three companies together made 466,061 pounds of contained V_2O_5 (261,000 pounds V), that sold for $472,866, from 13,066 short tons of ores. The V_2O_5 extracted from the ores was reported as ranging from 2 to 4.29 per cent, or 64 to 86 per cent of the V_2O_5 in the ores treated. The totals, however, indicate less than a 2 per cent recovery. The selling price was 39.8 cents to $1.05 per pound for the contained V_2O_5. The difference in price is probably not due to quality but to salesmanship.

So far as is known, no vanadinite or other vanadates of the common metals were produced in this country, though they were still of interest to prospectors and miners at Goodsprings, Nev., and at various points in Arizona.

British Southwest Africa.—Descloizite and vanadinite were exported during 1925 from the former German Southwest Africa to the following countries: United Kingdom, 775 short tons, valued at £35,840; Germany, 1,359 tons, valued at £57,915; the United States, 633 tons, valued at £29,250; a total of 2,767 short tons, valued at £123,005. The ore is thought to carry about 10 per cent of elemental vanadium, or about 553,000 pounds.

Northern Rhodesia.—The vanadium ore from Northern Rhodesia is thought to be all vanadinite from Broken Hill. According to official reports 1,176 short tons, valued at £35,350, were exported, of which 1 ton was sent to the United States and the remainder to Germany. This ore probably carried about 10 per cent of elemental vanadium, or about 235,200 pounds.

Peru.—The shipments of vanadium ore from Peru during the year amounted to 3,433,371 pounds. Imports from Peru into the United States during the year were 4,088,242 pounds of vanadium ore, valued at $259,620, showing a considerable lag from the Peruvian shipments of 1924. The ore minerals are patronite (vanadium sulphide) and

[21] Work cited, p. 1776.

its oxidation products and were from the mine of the Vanadium Corporation of America at Minasragra. Presumably the ore received carried about 11 per cent of elemental vanadium, or 449,707 pounds, and that exported from Peru contained 377,671 pounds.

Sweden.—It was reported during the year that efforts were to be made to save vanadium from the slags of Swedish iron ores. Whether this was done is not known.

WORLD'S PRODUCTION

The world's production of vanadium contained in ore or concentrates in 1925 was apparently as follows:

World's production of vanadium in ores and concentrates in 1925

Country		Pounds	Value
United States	production	261,000	$472,866
Peru	exports	377,671	306,009
Northern Rhodesia	do	235,200	172,048
British Southwest Africa	do	553,000	598,665
		1,426,871	1,549,579

The striking point in the table is the large African production, which has temporarily, at least, far outstripped the Peruvian output. Whether the reserves in Africa are equal to those in Peru seems at present to be doubtful.

The value quoted is too high for ores or concentrates. The American value is for fused oxide, and the value for the African concentrates undoubtedly is partly based on the lead content.

The imports of vanadium ores into the United States are shown by the following tables:

Vanadium ore (steel-hardening) imported for consumption in the United States, 1918–1925

Year	Pounds	Value	Year	Pounds	Value
1918, July to December [1]	1,772,215	$5,333	1922	611,170	$86,776
1919	6,026,005	67,846	1923	4,177,115	229,210
1920	20,673,296	1,080,935	1924	14,116,596	722,731
1921	10,307,540	543,061	1925	4,735,461	339,468

[1] Not separately classified prior to July, 1918.

Vanadium ores produced in and imported into the United States in 1925

	Ore		Value
	Pounds	Estimated vanadium content (pounds)	
Production	26,132,000	261,000	$472,866
Imports:			
Germany	109,760	10,976	10,643
British South Africa	535,034	53,503	68,905
Portuguese East Africa	2,425	242	300
Peru	4,088,242	449,707	259,620
	30,867,461	775,428	812,334

In order to show the probable American consumption there should be subtracted from this total a quantity of fused oxide sent to Germany.

The African vanadium ore shipped to Germany during the year amounted to 2,534 tons and was thought to contain about 506,800 pounds of vanadium. The ore reshipped to the United States was probably more than offset by the fused oxide imported from America. It seems, therefore, that Germany used during the year about two-thirds as much vanadium as the United States.

FERROVANADIUM[22]

The ferrovanadium produced in 1925 amounted to 2,981,145 pounds, averaging 35.39 per cent of vanadium and containing 1,055,035 pounds of vanadium (metal). Ferrovanadium was made at 4 furnaces—3 electric and 1 aluminothermic—by 4 producers in both 1925 and 1924; that produced in 1925 was chiefly from Peruvian ore. Some vanadium oxide, made from carnotite and roscoelite mined in Colorado and Utah, was also used.

The shipments of ferrovanadium in 1925 were 4,123,077 pounds, which contained 1,465,825 pounds of vanadium and were valued at the furnaces at an average of $3.30 per pound of contained vanadium, as compared with $3.40 in 1924.

TECHNOLOGY

The extraction of vanadium from the numerous rocks and minerals in which it is found is a perennially attractive subject to chemists and metallurgists. One of the most attractive phases is the extraction of vanadium from iron ores, many of which carry as much as 0.1 to 0.3 per cent of V_2O_5. In the titaniferous and phosphorus-bearing ores the content is known to reach 0.7 per cent. At various times vanadium has been extracted from the minette and other French iron ores, and German metallurgists also extracted vanadium from iron ores when their country was at war.[23] It is well known that certain Swedish iron ores carry vanadium and Rutger von Seth[23] proposes to extract the vanadium by first reducing the vanadium with the iron in the blast furnace and then slagging it off during the process of refining the pig. The process requires the use of two converters. Von Seth estimates that a concentration of 50 times the percentage of vanadium in the ore is obtained in the slag and that the cost of V_2O_5 in the slag is about 12 cents a pound. He has obtained patents and expected to have the process tried out in Sweden at the Domnarvet and Bangbro smelters during the year.

United States patent 1540154 was issued June 2, 1925, to Albert Wittig of Berlin. The patent covers the treatment of vanadium ore with a mixture of sulphuric and sulphurous acid (made by adding to the sulphuric acid at least 5 parts by weight of sulphur dioxide to 100 parts of the ore to be treated), by which the vanadium is put into solution.

---

[22] Figures compiled by H. W. Davis, of the Bureau of Mines.

[23] Krusch, quoted by Rutger von Seth, "Vanadium in iron ores and its extraction": Eng. and Min. Jour.-Press, vol. 120, 1925, pp. 51–56.

Under United States patent 1544911, issued July 2, 1925, to Frederick Laist, assignor to the Anaconda Copper Mining Co., vanadium is separated from phosphoric acid solutions containing it by precipitation with a ferrocyanide of an alkaline-earth metal; the ferrocyanide is regenerated after precipitation by treating the precipitates with the hydroxide of an alkaline-earth metal.

The object is evidently to extract vanadium from the Idaho phosphate rock treated by the company.

GOLD, SILVER, COPPER, LEAD, AND ZINC IN MONTANA

(MINE REPORT)

By C. N. Gerry

PRODUCTION

SUMMARY

The value of the mine production of gold, silver, copper, lead, and zinc in Montana in 1925 was 11 per cent more than that in 1924, because of the large increase in the output of copper and the general increase in metal prices. There were large declines in the quantity of gold, lead, and zinc, and a slight decline in silver, but the value of the silver, lead, and zinc increased because of the higher prices of these metals. Silver Bow County, which includes the Butte or Summit Valley district, continued to produce most of the silver, copper, lead, and zinc, and produced nearly half of the gold in 1925. Published reports show that the Anaconda Copper Mining Co., Butte & Superior Mining Co., Butte Copper & Zinc Co., and Jardine Mining Co. paid dividends amounting to $9,902,239. This amount does not include the distribution of $296,000 paid by the Barnes-King Development Co. when the company was dissolved. No complete record of Montana dividends has ever been kept, but adding the dividends of the current year to an estimate made by one of the min- the journals[1] gives a total of $344,640,607 to the end of 1925. The Anaconda, Amalgamated, North Butte, Butte & Superior, and Parrott companies have paid the larger part of this total.

Mine production of gold, silver, copper, lead, and zinc in Montana in 1925

	Number of producers	Ore, tailings, and slag	Gold [1]	Silver [1]	Copper	Lead	Zinc	Total value
		Short tons		*Fine ounces*	*Pounds*	*Pounds*	*Pounds*	
1925	424	4, 405, 008	$1, 697, 630	13, 158, 191	268, 910, 847	37, 530, 644	115, 316, 922	$61, 044, 006
Increase or decrease from 1924	+36	−247, 474	−325, 195	−131, 112	+19, 758, 785	−1, 945, 364	−13, 158, 296	+5, 969, 458

[1] Includes placer production.

A summary of the production of ore and metals in Montana from 1911 to 1925, by kinds, has been made, bringing up to date the tables published in Mineral Resources for 1922. The totals, by years, show that the output of lead and zinc has increased decidedly since the

[1] Mining Truth, May 16, 1925, p. 10.

pre-war period, that the output of silver and copper has been upheld, but that the output of gold declined steadily for six years after 1915. During the past 15 years 60 per cent of the total yield of gold was recovered from dry and siliceous ore, 15 per cent from placers, and 18 per cent from copper ore. Most of the silver, or 62 per cent, was recovered from copper ore, 22 per cent from zinc and lead-zinc ore, and nearly 11 per cent from dry and siliceous ore. Virtually all of the copper, except about 1 per cent from zinc and lead-zinc ore, was recovered from copper ore. Sixty-eight per cent of the output of lead was derived from zinc ore and lead-zinc ore and 27 per cent from lead ore. Zinc was recovered almost entirely from lead-zinc ore, zinc ore, and copper-lead-zinc ore.

ORE

The quantity of ore, old tailings, and slag sold or treated in Montana in 1925 was 5 per cent less than that of 1924, but the average value in recovered metals a ton increased from $11.71 to $13.69. Of the total ore, etc., 90 per cent was concentrated, 2 per cent was treated in gold and silver mills, and 4 per cent was shipped directly to smelters. The remaining 4 per cent consisted of slag, which was resmelted, and old tailings, which were smelted, concentrated, or cyanided.

Mines in Silver Bow County produced 88 per cent of the total ore and old tailings sold or treated. The dry and siliceous ore was mainly gold ore and silver ore. The gold ore included much gold-bearing iron ore from Deer Lodge and Broadwater Counties, which was used as a flux at the smelters. Copper ore and old tailings represented 72 per cent of the total output, and lead-zinc ore and old tailings nearly 16 per cent. The quantities of different kinds of first-class shipping ore and concentrates, with their recoverable contents, are given in the tables on pages 634 to 635. Copper ore and copper concentrates exceeded all other kinds. Most of the ore, whether of shipping or milling grade, was sulphide.

Ore and metals produced in Montana in 1925, by sources

Source	Number of producers	Ore, tailings, and slag		Gold		Silver	
		Short tons	Per cent	Fine ounces	Per cent	Fine ounces	Per cent
Dry gold ore	98	[1] 149,721	3.40	34,351.64	41.83	124,431	0.95
Dry gold and silver ore	11	[2] 1,209	.03	276.45	.34	6,439	.05
Dry silver ore	68	[3] 43,761	.99	3,453.34	4.21	460,499	3.50
Copper ore	26	[4] 3,190,841	72.44	32,352.64	39.40	8,656,401	65.79
Lead ore	116	[5] 118,062	2.68	2,393.79	2.91	532,219	4.04
Zinc ore	1	19,271	.44	165.91	.20	133,587	1.02
Copper-lead ore	5	195,327	4.43	2,113.50	2.57	555,365	4.22
Lead-zinc ore	40	[6] 686,816	15.59	5,110.33	6.22	2,688,845	20.43
Total lode mines		4,405,008	100.00	80,217.60	97.68	13,157,786	100.00
Total placers	93			1,905.25	2.32	405	
		4,405,008	100.00	82,122.85	100.00	13,158,191	100.00

[1] Includes 10,432 tons of old tailings concentrated and 100 tons of old tailings cyanided.
[2] Includes 600 tons of old tailings cyanided.
[3] Includes 235 tons of old tailings sold to a smelter and 25,000 tons of old tailings cyanided.
[4] Includes 60,754 tons of old tailings sold to a smelter.
[5] Includes 25,000 tons of old tailings concentrated and 53,013 tons of slag sold to a smelter.
[6] Includes 1,444 tons of old tailings concentrated.

Ore and metals produced in Montana in 1925, by sources—Continued

Source	Copper		Lead		Zinc	
	Pounds	Per cent	Pounds	Per cent	Pounds	Per cent
Dry gold ore	128,707	0.05	260,895	0.70		
Dry gold and silver ore	2,561		4,701	.01		
Dry silver ore	26,477	.01	102,532	.27		
Copper ore	[1] 265,201,209	98.62				
Lead ore	387,701	.15	9,320,422	24.83		
Zinc ore	165,750	.06	348,871	.93	3,201,404	2.78
Copper-lead ore	1,382,541	.51	2,576,816	6.87		
Lead-zinc ore	1,615,901	.60	24,916,407	66.39	112,115,518	97.22
	268,910,847	100.00	37,530,644	100.00	115,316,922	100.00

[1] Includes 4,804,364 pounds of copper recovered from precipitates.

GOLD ORE

Gold ore, largely dry and siliceous, was mined by 98 producers in 1925, compared with 110 in 1924. This ore and old tailings yielded on the average $4.74 in gold and 0.83 ounce of silver to the ton, and a little copper and lead, and was valued at $5.59 in recovered metals a ton. Park, Jefferson, Lewis and Clark, Deer Lodge, Madison, and Broadwater Counties, in the order named, produced most of the gold ore; the Jardine mine at Jardine, in Park County, was the largest producer, with the Jib property at Basin, in Jefferson County, following.

Dry gold ore and old tailings sold or treated in Montana in 1925, with content in terms of recovered metals

County	Ore and tailings	Gold	Silver	Copper	Lead
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*
Beaverhead	226	373.26	1,063		
Broadwater	1,081	541.67	217	114	
Deer Lodge	2,864	1,542.57	438	2,067	
Fergus	129	431.67	310		
Gallatin	8	4.29	4		
Granite	483	533.21	590	162	
Jefferson	[1] 57,192	9,453.24	93,094	123,816	258,638
Lewis and Clark	16,533	5,513.88	22,348		632
Madison	1,511	1,618.46	4,598	2,048	1,625
Meagher	14	26.40	4		
Mineral	170	11.96	5		
Park	69,409	14,182.46	1,511		
Powell	27	21.60	15		
Ravalli	60	19.94	5		
Silver Bow	14	77.03	229	590	
	149,721	34,351.64	124,431	128,707	260,895

[1] Includes 100 tons of old tailings cyanided and 10,432 tons of old tailings concentrated.

GOLD AND SILVER ORE

Gold and silver ore and old tailings were shipped or treated from five counties by 11 producers, who reported an output that yielded on the average $4.73 in gold and 5.33 ounces of silver to the ton, 0.11 per cent of copper, and 0.19 per cent of lead. Most of the output was ore and old tailings from the Summit district, Madison County, which were treated by cyanidation.

Dry gold and silver ore and old tailings sold or treated in Montana in 1925, with content in terms of recovered metals

County	Ore and tailings	Gold	Silver	Copper	Lead
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*
Granite	81	56.41	2,011		
Jefferson	153	64.71	1,695	2,134	
Madison	[1] 959	146.36	2,511	427	4,70
Phillips	15	8.72	214		
Silver Bow	1	.25	8		
	1,209	276.45	6,439	2,561	4,70

[1] Includes 600 tons of old tailings cyanided.

SILVER ORE

A total of 68 producers reported the output of siliceous silver ore and old tailings, which yielded on the average $1.63 in gold and 10.52 ounces of silver to the ton, 0.03 per cent of copper, and 0.12 per cent of lead. The output of this class of ore showed a marked decrease, especially from the mines at Butte. Some of the large producers of silver ore or old tailings were the Elkhorn dump, in Jefferson County, the Champion mine, in Deer Lodge County, the Minnie Jane and Goldsmith properties, at Butte, in Silver Bow County, and the Granite Bimetallic mine, at Philipsburg, in Granite County.

Dry silver ore and old tailings sold or treated in Montana in 1925, with content in terms of recovered metals

County	Ore and tailings	Gold	Silver	Copper	Lead
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*
Beaverhead	[1] 298	13.23	12,197	4,470	19,872
Cascade	242	459.39	35,031		59
Deer Lodge	5,249	161.34	49,288		
Fergus	74	4.29	2,156		
Granite	3,616	616.69	66,380	2,870	
Jefferson	[2] 26,263	246.52	86,201	18,410	77,663
Lewis and Clark	170	4.80	6,367		4,938
Madison	44	28.19	2,862		
Ravalli	14	.51	439	533	
Silver Bow	7,791	1,918.38	199,578	194	
	43,761	3,453.34	460,499	26,477	102,532

[1] Includes 235 tons of old tailings sold to a smelter.
[2] Includes 25,000 tons of old tailings cyanided.

COPPER ORE

In 1925 copper producers mined ore of much better grade than in preceding years. Copper ore and old tailings decreased 7 per cent in quantity, compared with 1924, although there was a large increase in the metal contents. The output, reported by 26 producers, represented 72 per cent of the State total. The average yield of the ore and old tailings, which showed a marked increase, was 21 cents in gold and 2.71 ounces of silver to the ton and 4.08 per cent of copper, or 81.6 pounds to the ton; the average value in recovered metals a ton was $13.68. Nearly all the copper ore was mined at

Butte—largely from the Anaconda, Butte & Superior, Anselmo, East Butte, Elm Orlu, and North Butte properties—and most of it was milling ore. The Liberty-Montana mine in Madison County produced much copper ore of milling grade which contained considerable gold.

Copper ore and old tailings sold or treated in Montana in 1925, with content in terms of recovered metals

County	Ore and tailings	Gold	Silver	Copper
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*
Broadwater	19	0.48	32	2,822
Granite	542	4.68	2,716	98,367
Jefferson	45	.33	196	4,120
Lewis and Clark	60	1.70	658	10,651
Madison	17,009	3,080.16	16,714	170,112
Missoula	489	38.05	4,670	30,351
Powell	3	.10	3	711
Sanders	54	10.72	974	19,646
Silver Bow	[1] 3,172,620	29,216.42	8,630,438	[2] 264,864,129
	3,190,841	32,352.64	8,656,401	265,201,209

[1] Includes 60,754 tons of old tailings sold to a smelter.
[2] Includes 4,804,364 pounds of copper recovered from precipitates.

LEAD ORE

The output of lead ore, old tailings, and slag by 116 producers yielded metals valued at $1,284,774, or an average of $10.88 in recovered metals a ton. The average yield was 42 cents in gold and 4.51 ounces of silver to the ton, 0.16 per cent of copper, and 3.95 per cent of lead. Beaverhead, Judith Basin, Jefferson, and Cascade Counties yielded most of the lead ore, and the Hecla slag dump, Block P., Jefferson Milling Co., and Gibson slag dump were large producers.

Lead ore, old tailings, and slag sold or treated in Montana in 1925, with content in terms of recovered metals

County	Ore, tailings, and slag	Gold	Silver	Copper	Lead
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*
Beaverhead	[1] 31,050	344.58	48,707	155,096	2,715,465
Broadwater	960	61.50	13,226	1,202	376,418
Cascade	[2] 24,291	41.20	135,789	123,152	1,564,281
Gallatin	36		14		4,085
Granite	2,827	31.60	21,250	4,707	173,612
Jefferson	[3] 26,959	968.99	120,763	58,349	777,600
Judith Basin	[4] 29,273	439.10	148,285	5,918	2,836,289
Lewis and Clark	501	100.10	11,555	5,909	244,855
Lincoln	29	15.18	482		7,686
Madison	648	153.35	10,987	2,027	343,022
Meagher	[5] 156		149		13,715
Missoula	1,193	105.42	14,593	31,070	209,739
Powell	113	128.35	5,528	34	48,075
Silver Bow	26	4.42	891	237	5,580
	118,062	2,393.79	532,219	387,701	9,320,422

[1] Includes 29,308 tons of slag sold to a smelter.
[2] Includes 21,468 tons of slag sold to a smelter.
[3] Includes 25,000 tons of old tailings concentrated and 795 tons of slag sold to a smelter.
[4] Includes 1,308 tons of slag sold to a smelter.
[5] Includes 134 tons of slag sold to a smelter.

COPPER-LEAD ORE

The output of copper-lead ore was reported by five producers. The average yield was 22 cents in gold and 2.84 ounces of silver to the ton, 0.35 per cent of copper, and 0.66 per cent of lead; the average value in recovered metals a ton was $4.35. Most of the output was mill ore from the Silver Dyke property, in Cascade County, but part of it came from the Boston-Montana property, in Beaverhead County, and the Jib mine, at Basin, in Jefferson County.

Copper-lead ore sold or treated in Montana in 1925, with content in terms of recovered metals

County	Ore	Gold	Silver	Copper	Lead
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*
Beaverhead	20,247	241.90	60,904	136,653	361,310
Cascade	167,847	211.17	459,260	1,219,200	2,096,795
Jefferson	7,200	1,660.33	33,237	24,374	99,158
Sanders	33	.10	1,964	2,314	19,553
	195,327	2,113.50	555,365	1,382,541	2,576,816

ZINC ORE

Zinc ore, all of which was milled at Anaconda, was mined by one producer at Butte. The average yield of the ore was 18 cents in gold and 6.93 ounces of silver to the ton, 0.43 per cent of copper, 0.91 per cent of lead, and 8.31 per cent of zinc, and the average value in recovered metals a ton was $20.41.

LEAD-ZINC ORE

Lead-zinc ore and old tailings represented nearly 16 per cent of the total output, and was reported by 40 producers; the average yield was 15 cents in gold and 3.91 ounces of silver to the ton, 0.12 per cent of copper, 1.81 per cent of lead, and 8.16 per cent of zinc. The average value in recovered metals a ton was $18.77. Eight mines at Butte produced nearly 95 per cent of the lead-zinc ore; all of it was milled at Butte or Anaconda. The Butte & Superior, Elm Orlu, Emma, Poser, and Moulton mines, at Butte, were the largest producers. It has been the practice at Anaconda to make a lead-zinc concentrate for leaching at Great Falls, but in 1925 it was found more economical to separate a high-grade lead concentrate, for direct smelting at East Helena, in addition to the lead-zinc concentrate for leaching. The Timber Butte custom mill at Butte made mainly two products—a silver-lead concentrate and a silver-zinc concentrate.

Lead-zinc ore and old tailings sold or treated in Montana in 1925, with content in terms of recovered metals

County	Ore and tailings	Gold	Silver	Copper	Lead	Zinc
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*
Cascade	909	7.09	9,417	136	44,859	101,966
Granite	1,467	29.89	27,707	----------	80,633	203,149
Jefferson	[1] 2,537	198.17	20,241	8,643	222,073	396,396
Judith Basin	19	.13	430	----------	3,028	5,315
Lewis and Clark	158	3.27	1,216	1,797	35,722	34,964
Lincoln	12,595	86.34	9,287	----------	518,900	336,604
Madison	1,530	35.56	5,349	108	79,902	117,285
Mineral	4,835	.40	11,406	----------	86,643	280,500
Sanders	88	----------	228	----------	16,896	62,832
Silver Bow	662,678	4,749.48	2,603,564	1,605,847	23,827,751	110,578,517
	686,816	5,110.33	2,688,845	1,615,901	24,916,407	112,115,518

[1] Includes 1,444 tons of old tailings concentrated.

The following table gives the zinc products made in 1925, with their zinc content (assay) and the zinc recovered from each:

Lead-zinc ore and concentrates (as marketed from Montana mines and mills) sold to smelters in 1925

Classification	County	Quantity (dry weight)	Gross zinc	Average assay of ore or concentrates	Recovered zinc
		Short tons	*Pounds*	*Per cent*	*Pounds*
Sulphide lead-zinc ore	Sanders	88	73,920	42.00	62,832
Lead-zinc concentrates	Cascade and Silver Bow	20,222	22,457,640	55.53	20,123,628
Zinc concentrates	Cascade, Granite, Jefferson, Judith Basin, Lewis and Clark, Lincoln, Madison, Mineral, and Silver Bow.	104,703	105,826,808	50.54	95,130,462
		125,013	128,358,368	51.34	115,316,922

GOLD

The output of gold in Montana in 1925 was 16 per cent less than that of 1924, due in large part to the striking decrease in the output of gold from the Jib mine, at Basin, in Jefferson County. The output decreased from $5,004,195 in 1915 to $1,697,630 in 1925. Silver Bow County reported the largest output, or nearly half of the total, owing to steady operations at Butte. Park County was second, followed by Jefferson, Lewis and Clark, Madison, Deer Lodge, and Granite Counties. A good increase was reported from Park County, at Jardine, and from Madison County, although dredge operations in Alder Gulch ceased in 1922. Mines at Butte produced more gold, though less ore was treated. Amalgamation and cyanidation mills produced 15 per cent of the gold, making an average recovery of

$2.27 in gold and 56 cents in silver to the ton of ore and old tailings treated. Concentrates of all kinds yielded 66 per cent of the total output of gold, and crude ore shipped to smelters yielded 16 per cent. Dry and siliceous ore yielded 46 per cent of the gold, copper ore nearly 40 per cent, lead-zinc ore 6 per cent, lead ore 3 per cent, zinc ore and copper-lead ore 3 per cent, and placers 2 per cent. There was a large increase in gold from copper ore, but a decided decrease (more than 25,000 ounces) in gold from siliceous ore, especially gold ore.

Five properties produced 74 per cent of the total output of gold. The Anaconda property at Butte ranked first, followed by the Jardine mine, in the Sheepeater district, Park County, the Jib mine at Basin, Jefferson County, the Drumlummon mine near Marysville, Lewis and Clark County, and the Liberty-Montana property near Jefferson Island, Madison County.

SILVER

The output of silver from mines in Montana in 1925 was 1 per cent less than in 1924 but exceeded the yearly average, 13,039,557 ounces, of the decade 1916–1925. Nearly 66 per cent of the silver was obtained from copper ore, and 20 per cent from lead-zinc ore. Silver Bow County, chiefly the Butte district, produced 88 per cent of the total. Concentrates yielded 91 per cent of the silver, first-class smelting ore 6 per cent, old tailings and slag smelted 2 per cent, and bullion and precipitates from ore treated in cyanidation and amalgamation mills contained nearly 1 per cent.

Eight properties produced 85 per cent of the silver; each of these yielded more than 250,000 ounces, and two of them, the copper mines of the Anaconda Co. and the Butte & Superior mine, more than 1,800,000 ounces each. The other six large producers were the Elm Orlu, Silver Dyke, Anselmo, Emma, Poser, and the zinc mines of the Anaconda Co.

COPPER

The mine production of copper in 1925 was 8 per cent greater in quantity than in 1924 and considerably more than any year since 1918, when the mines of Montana produced 323,174,850 pounds of copper. As the average price of copper increased more than a cent a pound, the value of the copper output increased 17 per cent. The copper mines at Butte were more vigorously operated than they had been for seven years.

The total output of copper, except for 2,273,890 pounds, came from Silver Bow County, which includes the Butte district. Copper ore yielded 98.6 per cent of the copper. Concentrates yielded 92 per cent of the copper, and crude ore of all kinds shipped to smelters 5 per cent; the remainder was represented by copper saved from old tailings, slag, and precipitates. The sulphide copper ore of smelting grade yielded 12,419,344 pounds, an average of 4.95 per cent, and the oxidized ore 160,376 pounds, an average of 6.76 per

cent. Slag resmelted, old tailings, and the copper precipitates from mine waters yielded 7,785,330 pounds.

Six properties in Montana each produced more than 1,500,000 pounds of copper in 1925. The mines of the Anaconda Copper Mining Co. yielded more than all others combined; the other five properties were the Butte & Superior, Anselmo, East Butte, Elm Orlu, and North Butte. Considerable copper was produced from old tailings resmelted at Anaconda and from ore of the Silver Dyke property in Cascade County.

LEAD

The mine production of lead in Montana was 5 per cent less in quantity than in 1924. Nearly 65 per cent of the output was derived from mines in Silver Bow County, and most of the remainder was recovered from ores mined in Cascade, Beaverhead, Judith Basin, and Jefferson Counties. Lead-zinc ore and old tailings yielded 66 per cent of the lead, lead ore with old tailings and slag 25 per cent, copper-lead ore 7 per cent, dry and siliceous ore 1 per cent, and zinc ore 1 per cent. Concentrates yielded 82 per cent of the total output of lead, crude ore of all kinds shipped to the smelters 9 per cent, and old slag and old tailings 9 per cent. The greater part of the lead from Montana mines, saved at East Helena, arrives at the smelter in the form of residues from the zinc plant at Great Falls, or as lead concentrate from the mill at Anaconda.

Nine properties—Emma, Butte & Superior, Elm Orlu, Silver Dyke, Block P., Hecla slag dump, Moulton, Poser, and the zinc mines of the Anaconda Co., each yielding more than 1,500,000 pounds—produced nearly all the lead.

ZINC

The mine production of zinc in Montana in 1925 was 10 per cent less in quantity than in 1924, although the value was $413,197 (5 per cent) more. This increase in value was due to the increased average price of the metal, which was 7.6 cents a pound in 1925. The zinc output from the Butte & Superior mine approximated that of 1924. The Emma, Moulton, and Poser mines reported good increases, but the Elm Orlu mine and the zinc property of the Anaconda Co. reported much less than in 1924. At Great Falls the electrolytic zinc plant of the Anaconda Co. was operated continuously, even during the period of enlargement, although much of the material treated was custom concentrate from other Western States. No zinc material was shipped to eastern smelters, but some concentrate was shipped for export to Belgium. The Butte & Superior Mining Co., which shipped its entire lead-zinc product to Anaconda for milling, produced approximately 40 per cent of the zinc of the State. Lead-zinc ore and old tailings yielded 97 per cent of the zinc, and zinc ore 3 per cent.

Eight properties at Butte—the Butte & Superior, Elm Orlu, Emma, Poser, Moulton, Anaconda (zinc), Anselmo, and Midwest Butte—produced nearly all the zinc.

MINING AND METALLURGIC INDUSTRY

Metal mines in Montana continued operations at a quiet pace in 1925, undisturbed by labor strikes or serious catastrophies. The output of copper, the main product, increased about 8 per cent, making a total larger than that of any year since 1918. Montana is recognized as the second largest producer of copper in the United States but is not often thought of as second, following Utah, in the production of silver, and fourth, following Oklahoma, Kansas, and New Jersey, in the production of zinc. In 1925 the consumption of copper exceeded the production, and the price was 1.1 cents a pound more than in 1924. The companies at Butte, however, did not seek to increase production greatly, but confined their efforts to reducing costs and to producing higher-grade ore by selective mining. In general, milling practice has been improved with the development of flotation, and much ore, especially zinc ore and lead-zinc ore formerly of little value, is finding a market through custom milling plants. At the same time the success of the electrolytic process for zinc ores continues to be demonstrated by regular operation and by the increase in the capacity of the plant at Great Falls, which now receives much custom ore from Montana and other States. Although Montana does not produce nearly as much copper as Arizona, it produces considerably more finished metal products, such as copper wire, zinc slabs, and refined arsenic, for use in the West.

Some idea of the importance of the mining industry in Montana may be gained from the fact that the average expenditures of the Anaconda Copper Mining Co. within the State from 1914 to 1923 were more than $47,000,000 a year, and the company employed an average of 14,841 men. The costs of labor, transportation, fuel, and taxes are high in comparison with those of other large copper-producing regions in South America and Africa. In addition, the cost of mining at greater depth is constantly increasing, and the company is planning to install large hoists capable of lifting ore 5,000 feet, as soon as the mines are opened to that depth.

Forty-one milling plants of various sizes were active in Montana in 1925, although many of them ran for short periods only. They included 10 plants using the amalgamation process, 5 using amalgamation and concentration, 5 using cyanidation, 1 using amalgamation, concentration, and cyanidation, 3 using table concentration, 7 using flotation equipment after table concentration, and 7 using straight flotation. Two copper-precipitating plants that recover copper from mine waters and one electrolytic zinc-leaching plant are included in the total. A revised list of the active and idle milling plants in Montana for 1925, with their equipment, has been prepared by the Bureau of Mines and may be had on request. Under Silver Bow County (p. 661) reference is made to an article giving details of the milling practice at the Timber Butte custom flotation mill near Butte.

Of the ore and old tailings treated at gold and silver mills, 71,237 tons of ore was treated by amalgamation, with an average recovery per ton of $1.98 in gold and 0.02 ounce of silver, and 16,872 tons of ore and 25,700 tons of old tailings were treated by cyanidation, with an average recovery per ton of $2.75 in gold and 2.11 ounces of silver. During the year 243 pounds of quicksilver was purchased—0.0034 pound per ton of ore amalgamated and 0.029 pound per ounce of gold and silver bullion recovered—and 54,684 pounds of sodium cyanide was used in gold and silver mills—0.57 pound per ounce of gold and silver bullion and 1.28 pounds per ton of ore and old tailings treated. The quantity of ore and old tailings treated by these processes in 1925 increased 16 per cent, due largely to the increased output of the Jardine mine in Park County. The quantity of gold recovered by cyanidation decreased 15 per cent, and that recovered by amalgamation increased 33 per cent.

Gold and silver produced at mills in Montana in 1925, by counties

County	Ore (short tons)	Bullion (fine ounces) recovered by—				Total value
		Amalgamation		Cyanidation		
		Gold	Silver	Gold	Silver	
Beaverhead	21			13.28	59	$316
Broadwater	4	40.39	7			840
Fergus	37			25.70	12	539
Gallatin	8	4.29	4			92
Granite	[1] 420	155.51	20			3,229
Jefferson	133	92.89	89	[2] 199.75	[2] 64,412	50,813
Lewis and Clark	16,475	221.74	564	5,184.56	21,183	126,850
Madison	[3] 1,357	298.81	96	[4] 227.25	[4] 4,021	13,732
Mineral	170	11.96	5			251
Park	[5] 69,409	5,989.24	868			124,411
Phillips	15			8.72	214	328
Ravalli	60	19.94	5			416
	88,109	6,834.77	1,658	5,659.26	89,901	321,817

[1] Also yielded 65 tons of siliceous concentrate.
[2] Includes bullion from 25,100 tons of old tailings.
[3] Also yielded 23 tons of siliceous concentrate and 3 tons of lead concentrate.
[4] Includes bullion from 600 tons of old tailings.
[5] Also yielded 5,193 tons of siliceous concentrate.

Concentrating mills in Montana treated 91.3 per cent of the total material mined or treated. The resulting concentrates averaged $37.83 in recovered metal a ton compared with $32.83 in 1924, although the quantity of concentrates produced was 5 per cent less than in 1924. The decrease was especially marked in lead-zinc concentrate and copper concentrate, but an increase was noticeable in zinc concentrate and lead concentrate. The copper concentrate, which exceeded all others in total value of metal recovered, was the least valuable per ton.

Mine production of metals from Montana concentrates in 1925

BY COUNTIES

	Ore to concentrating mills	Concentrates	Gold	Silver	Copper	Lead	Zinc	Total value of metal
	Short tons	*Short tons*	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*	
Beaverhead	20,095	2,386	237.22	49,920	123,255	288,879		$82,182
Broadwater	852	213	286.50	40				5,950
Cascade	168,756	9,968	218.26	468,677	1,219,306	2,141,654	101,960	696,989
Deer Lodge	5,200	184	157.90	47,841				36,466
Granite	3,912	635	281.27	35,370	4,501	157,121	203,149	60,109
Jefferson	[1] 54,222	[2] 9,514	9,038.73	233,708	202,451	1,000,469	396,396	494,955
Judith Basin	27,519	7,467	420.13	132,282		2,389,634	3,315	308,639
Lewis and Clark	158	76	3.27	1,216	1,797	35,722	34,964	6,932
Lincoln	12,595	895	86.34	9,287		518,900	336,600	78,956
Madison	18,609	1,325	3,306.10	22,624	169,839	81,656	117,285	124,179
Mineral	4,835	414	.40	11,406		86,643	280,500	36,780
Park		5,198	8,193.22	643				169,815
Silver Bow	3,668,320	1,446,340	32,062.08	10,979,727	246,651,852	24,176,622	113,779,921	54,057,915
	3,985,073	1,484,615	54,291.42	11,992,741	248,373,001	30,877,300	115,254,090	56,159,867

BY KINDS OF CONCENTRATES

Dry and siliceous	10,626	15,519.61	136,130	122,526	234,444			$453,089
Copper	1,312,190	30,364.19	8,265,323	245,063,851				41,162,885
Lead	24,701	5,063.23	1,102,696	394,729	17,718,073			2,467,584
Zinc	104,703	2,435.75	1,701,468	1,280,042	5,525,428	95,130,462		9,123,584
Copper-lead	12,173	448.39	509,180	1,342,455	2,385,674			760,823
Lead-zinc	20,222	453.25	277,944	169,398	5,013,681	20,123,628		2,191,902

AVERAGE RECOVERABLE CONTENT

	Short tons	*Fine ounces per ton*	*Fine ounces per ton*	*Per cent*	*Per cent*	*Per cent*	*Value per ton*
Dry and siliceous	10,626	1.460	12.81	0.58	1.10		$42.64
Copper	1,312,190	.023	6.30	9.34			31.37
Lead	24,701	.205	44.64	.80	35.87		99.90
Zinc	104,703	.023	16.25	.61	2.64	45.43	87.14
Copper-lead	12,173	.037	41.83	5.51	9.80		62.50
Lead-zinc	20,222	.022	13.74	.42	12.40	49.76	108.39
	1,484,615	.037	8.08	8.36	1.04	3.88	37.81

[1] Also 36,876 tons of old tailings.
[2] Includes concentrates from 36,876 tons of old tailings.

Crude ore directly smelted in 1925 averaged $19.09 in recovered metals a ton. An increase of 4 per cent was recorded in the total quantity of ore smelted, especially in copper ore and lead ore, but a decrease was shown in siliceous ore. The chief product was copper ore of comparatively little value per ton.

Mine production of metals from Montana crude ore shipped to smelters in 1925

BY COUNTIES

	Ore	Gold	Silver	Copper	Lead	Zinc	Total value of metal
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*	
Beaverhead	2,162	712.47	29,725	23,935	579,725	.....	$89,192
Broadwater	1,204	276.76	13,428	4,138	376,418	.....	48,376
Cascade	3,065	500.59	106,676	70,860	711,593	.....	156,352
Deer Lodge	2,913	1,546.01	1,885	2,067	.....	.....	33,560
Fergus	166	410.26	2,454	.....	.....	.....	10,184
Gallatin	36	.....	14	.....	4,085	.....	365
Granite	4,684	835.70	85,264	101,605	97,124	.....	99,326
Jefferson	3,223	3,240.79	53,685	29,246	381,937	.....	141,632
Judith Basin	465	19.10	13,974	1,143	316,264	.....	37,770
Lewis and Clark	789	214.18	19,181	16,560	250,425	.....	41,877
Lincoln	29	15.18	482	.....	7,686	.....	1,317
Madison	1,135	1,229.92	16,280	4,883	347,594	.....	67,657
Meagher	36	26.40	99	.....	3,911	.....	955
Missoula	1,682	143.47	19,263	61,421	209,739	.....	43,304
Powell	143	150.05	5,546	745	48,075	.....	11,240
Ravalli	14	.51	439	533	.....	.....	391
Sanders	175	10.82	3,166	21,960	36,449	62,832	13,485
Silver Bow	133,327	3,591.70	474,539	12,413,420	5,580	.....	2,166,768
	155,248	12,923.91	846,100	12,752,516	3,376,605	62,832	2,963,751

BY KINDS OF ORE

Dry and siliceous	18,163	10,045.19	360,082	31,741	112,479	.....	$471,842
Copper	126,708	1,647.68	283,096	12,579,720	.....	.....	2,016,849
Lead	10,104	1,226.26	189,746	125,343	3,155,246	.....	449,338
Copper-lead	185	4.78	12,948	15,712	91,984	.....	19,319
Lead-zinc	88	.....	228	.....	16,896	62,832	6,403

AVERAGE RECOVERABLE CONTENT

	Short tons	*Fine ounces per ton*	*Fine ounces per ton*	*Per cent*	*Per cent*	*Per cent*	*Value per ton*
Dry and siliceous	18,163	0.553	19.83	0.09	0.31	.....	$25.98
Copper:							
Oxidized	1,186	.045	6.58	6.76	.....	.....	24.70
Sulphide	125,522	.013	2.19	4.95	.....	.....	15.83
Lead:							
Oxidized	4,751	.152	12.50	.50	15.12	.....	39.54
Sulphide	5,353	.094	24.35	.73	16.06	.....	48.85
Copper-lead:							
Oxidized	152	.031	72.26	4.41	23.83	.....	104.77
Sulphide	33	.....	59.52	3.51	29.63	.....	102.88
Lead-zinc: Sulphide	88	.....	2.59	.....	9.60	35.70	72.76
	155,248	.083	5.45	4.11	1.09	.02	19.09

REVIEW BY COUNTIES AND DISTRICTS

The pages that follow show the production reported by counties and the output of each important mining district.

Mine production of gold, silver, copper, lead, and zinc in Montana in 1925

County	Gold					Silver [1]	
	Placers		Lode mines		Total value	Fine ounces	Value
	Fine ounces	Value	Fine ounces	Value			
Beaverhead	48.32	$999	972.97	$20.113	$21,112	122,875	$85,275
Broadwater	235.69	4,872	603.67	12,479	17,351	13,529	9,389
Cascade			718.85	14,860	14,860	639,497	443,811
Deer Lodge	14.42	298	1,703.91	35,223	35,521	49,726	34,510
Fergus	20.52	424	435.95	9,012	9,436	2,466	1,711
Gallatin			4.31	89	89	18	12
Granite	145.31	3,004	1,272.46	26,304	29,308	120,695	83,762
Jefferson	18.39	380	12,592.30	260,306	260,686	355,434	246,671
Judith Basin			439.24	9,080	9,080	148,715	103,208
Lewis and Clark	244.10	5,046	5,623.74	116,253	121,299	42,211	29,294
Lincoln			101.54	2,099	2,099	9,769	6,780
Madison	529.65	10,949	5,062.06	104,642	115,591	43,154	29,949
Meagher	9.68	200	26.41	546	746	154	107
Mineral	211.69	4,376	12.33	255	4,631	11,419	7,925
Missoula	38.31	792	143.48	2,966	3,758	19,264	13,370
Park	1.06	22	14,182.44	293,177	293,199	1,511	1,049
Phillips			8.71	180	180	214	148
Powell	313.28	6,476	150.06	3,102	9,578	5,628	3,906
Ravalli	13.45	278	20.46	423	701	444	308
Sanders			10.84	224	224	3,166	2,197
Silver Bow	59.98	1,240	36,131.87	746,912	748,152	11,568,302	8,028,402
Toole	1.40	29			29		
Total, 1924	1,905.25	39,385	80,217.60	1,658,245	1,697,630	13,158,191	9,131,784
	1,323.59	27,361	96,530.57	1,995,464	2,022,825	13,289,303	8,903,833

County	Copper		Lead		Zinc		Total value
	Pounds	Value	Pounds	Value	Pounds	Value	
Beaverhead	296,219	$42,063	3,096,647	$269,408			$417,858
Broadwater	4,138	588	376,418	32,748			60,076
Cascade	1,342,458	190,629	3,705,994	322,421	101,960	$7,749	979,470
Deer Lodge	2,067	293					70,324
Fergus							11,147
Gallatin			4,085	355			456
Granite	106,106	15,067	254,245	22,119	203,149	15,439	165,695
Jefferson	239,246	33,973	1,435,132	124,857	396,396	30,126	696,313
Judith Basin	5,918	840	2,839,317	247,021	3,315	252	360,401
Lewis and Clark	18,357	2,607	286,147	24,895	34,964	2,657	180,752
Lincoln			526,586	45,813	336,600	25,582	80,274
Madison	174,722	24,810	429,250	37,345	117,285	8,914	216,609
Meagher			13,715	1,193			2,046
Mineral			86,643	7,538	280,500	21,318	41,412
Missoula	61,421	8,722	209,739	18,247			44,097
Park							294,248
Phillips							328
Powell	745	106	48,075	4,183			17,773
Ravalli	533	76					1,085
Sanders	21,960	3,118	36,449	3,171	62,832	4,775	13,485
Silver Bow	266,636,957	37,862,448	24,182,202	2,103,852	113,779,921	8,647,274	57,390,128
Toole							29
Total, 1924	268,910,847	38,185,340	37,530,644	3,265,166	115,316,922	8,764,086	61,044,006
	249,152,062	32,638,920	39,476,008	3,158,081	128,475,218	8,350,889	55,074,548

[1] Includes placer production.

Ore, old tailings, and slag sold or treated, lode mines producing, and average value of ore, etc., in Montana, 1924–25

County	Ore, tailings, and slag sold or treated in 1925 (short tons)		Number of lode mines producing		Average total value per ton [1]		Average value per ton in gold and silver [1]	
	Total	Increase or decrease	1924	1925	1924	1925	1924	1925
Beaverhead	51,821	+14,979	11	16	$9.84	$8.04	$1.49	$2.03
Broadwater	2,060	−6,108	26	22	9.68	26.78	4.00	10.60
Cascade	193,289	+29,845	10	10	4.88	5.07	2.71	2.37
Deer Lodge	8,113	−4,477	8	7	8.54	8.63	8.54	8.60
Fergus	203	+99	8	8	21.87	52.82	20.96	52.82
Gallatin	44	+44	------	2	------	10.36	------	2.30
Granite	9,016	+6,873	17	19	28.31	18.04	25.79	12.20
Jefferson	120,349	+26,658	40	58	10.89	5.78	9.49	4.21
Judith Basin	29,292	+2,938	6	5	10.91	12.30	3.17	3.83
Lewis and Clark	17,322	−8,177	33	38	8.55	10.08	6.79	8.35
Lincoln	12,624	−20,630	2	3	4.31	6.36	.94	.70
Madison	21,701	+18,508	58	66	21.12	9.47	14.05	6.20
Meagher	170	−903	3	3	10.56	10.85	.74	3.84
Mineral	5,095	+4,888	3	3	14.74	7.40	12.01	1.63
Missoula	1,682	+1,682	------	2	------	25.75	------	9.71
Park	69,409	+20,163	5	1	4.26	4.24	4.25	4.24
Phillips	15	−3,931	2	1	20.28	21.87	20.05	21.87
Powell	143	−165	23	13	58.90	78.60	39.49	48.61
Ravalli	74	+66	2	2	17.75	10.91	17.75	9.88
Sanders	175	+142	1	5	91.09	77.06	23.42	13.83
Silver Bow	3,862,401	−329,970	44	47	[2] 12.17	14.68	2.07	2.27
	4,405,008	−247,474	302	331	[2] 11.71	13.69	2.34	2.45

[1] Placer product excluded.
[2] Figures revised to exclude value of copper recovered from precipitates

Number and production of producing placer mines in Montana, 1924–25

County	1924					1925				
	Mines		Gold	Silver	Total value	Mines		Gold	Silver	Total value
	Hydraulic and sluicing	Drift				Hydraulic and sluicing	Drift			
				Fine ounces					*Fine ounces*	
Beaverhead	8	1	$1,196	7	$1,201	7	1	$999	4	$1,002
Broadwater	7	------	2,562	21	2,576	12	------	4,872	54	4,909
Deer Lodge	2	------	302	1	303	2	------	298	------	298
Fergus	------	------	------	------	------	2	------	424	------	424
Granite	5	1	2,184	25	2,201	8	1	3,004	41	3,032
Jefferson	5	1	773	14	782	4	------	380	7	385
Lewis and Clark	11	3	2,353	27	2,371	11	3	5,046	67	5,092
Lincoln	3	------	519	2	520	------	------	------	------	------
Madison	10	------	6,354	48	6,386	11	------	10,949	133	11,041
Meagher	2	------	263	3	265	3	------	200	1	201
Mineral	12	------	4,653	8	4,658	10	------	[4] 376	8	4,382
Missoula	1	------	397	------	397	2	------	792	1	793
Park	------	1	53	------	53	------	1	22	------	22
Powell	5	------	2,628	20	2,642	10	2	6,476	82	6,533
Ravalli	3	------	1,675	6	1,679	1	------	278	------	278
Silver Bow	1	------	214	2	215	1	------	1,240	7	1,245
Sweet Grass	1	------	64	------	64	------	------	------	------	------
Toole	2	1	1,171	3	1,173	------	1	29	------	29
	78	8	27,361	187	27,486	84	9	39,385	405	39,666

BEAVERHEAD COUNTY

The value of the mine production of metals in Beaverhead County increased from $363,704 in 1924 to $417,858 in 1925, but most of the returns came from old slag shipped from the Hecla dump. The large mill of the Boston-Montana Mining Corporation was operated only partly during half of the year.

Argenta district.—One placer and seven lode mines in the Argenta district produced 1,742 tons of ore, $7,264 in gold, 8,847 ounces of silver, 9,495 pounds of copper, and 507,294 pounds of lead, valued in all at $58,887. The ore was a first-class product and yielded on the average $33.72 in metals a ton. Most of the output came from the Butte-Argenta mine, operated by the Iron Mountain Mining Co. More than 1,000 tons of oxidized lead ore was shipped to smelters in Utah. The Midnight mine, owned by the Monidah Trust Co., produced several hundred tons of oxidized ore, containing gold, silver, and lead. Other producers of the district were the Goldfinch, Ferdinand, Brownell, Dexter, and Anaconda mines. A little placer gold from Watson Creek was sold through storekeepers at Dillon.

Bannack district.—Three placers and two lode mines in the Bannack district yielded 226 tons of ore, $8,152 in gold, and 1,066 ounces of silver, valued together at $8,892. Most of the output came from the Golden Leaf mine, owned by the New York-Montana Mines Co., which produced a high-grade gold ore that was shipped to Anaconda. A test lot of rich gold ore was shipped from the Gold Bug property, also some placer gold from the Double Eagle and other claims at Bannack.

Beaverhead district.—Some placer gold was recovered by sluicing at the I. X. L. claim on Calf Creek.

Big Hole district.—Some placer gold was recovered by sluicing at the New Discovery claim.

Blue Wing district.—Several cars of silver ore were shipped from the New Departure and Huron mines near Bannack.

Bryant district (Melrose).—Three properties in the Bryant district produced 29,695 tons of ore, old tailings, and slag, yielding $303 in gold, 54,151 ounces of silver, 162,427 pounds of copper, and 2,300,474 pounds of lead, valued in all at $261,090. Several cars of oxidized copper-lead ore were shipped from the Hecla mine, but most of the metal output of the district was recovered from slag from the Hecla dump which was shipped to East Helena. Some old tailing containing silver was shipped to the copper smelter at Garfield, Utah.

Elkhorn district (Coolidge).—The Boston-Montana Mining Corporation, a reorganization of the Boston-Montana Corporation, worked its Elkhorn property the entire year and ran the 600-ton concentration-flotation mill six months, treating about 100 tons of ore a day. Copper-lead concentrate was shipped to International, Utah, and East Helena, Mont. The property is opened by more than 2 miles of underground workings, but figures on the quantity of ore in reserve are not published.

Pioneer district.—Unusually fine gold was recovered from placer claims on Pioneer Creek.

BROADWATER COUNTY

Backer district (*Canton*).—Eight placers and one lode mine in the Backer district yielded gold valued at $4,437 and 57 ounces of silver, valued together at $4,477. Some gold bullion was recovered from ore that occurs in small rich seams at the Slim Jim property. The placer gold came mainly from the Confederate Gulch, Montana Bar, Eldorado Bar, Cement Gulch, and other properties north of Canton and Townsend.

Beaver district.—Three lode mines in the Beaver district produced 41 tons of ore yielding $397 in gold, 2,438 ounces of silver, 288 pounds of copper, and 19,146 pounds of lead, valued in all at $3,796, or $92.59 a ton. One lot of lead ore containing considerable silver was shipped from the Little Olga property, and small lots of gold ore were shipped from the Hyantha and Little One mines, near Winston. The Montana-Idaho Copper Co. acquired the East Pacific mine, an old producer south of Winston; this mine is reported to have in reserve much ore and stope filling containing gold.

Cedar Plains district (*Radersburg*).—In the Cedar Plains district 1 placer and 14 lode mines produced 1,990 tons of ore, $11,583 in gold, 9,345 ounces of silver, 3,850 pounds of copper, and 349,990 pounds of lead, valued in all at $49,064. The ore yielded on the average $24.44 in metals a ton. Several hundred tons of silver-lead ore was shipped from the Daisy Dandy property at Radersburg and from the Summit mine, near Toston, operated by the Mendota Mining Co. Some gold-bearing iron ore from the Ohio Keating dump was shipped to Anaconda to be used as a flux, and several cars of similar ore were shipped from the Keating mine. The Mighty Monarch mine produced a car of rich gold ore, and the Greenhorn claim a little copper ore. Other producers in the district were the Kahoka, Last Chance, Ruby Silver, Silver Bell, Gopher, and Home Lode properties. A little gold was recovered from the Radersburg placer on Charity Gulch.

Park district (*Townsend*).—Three placers and four lode mines in the Park district produced 27 tons of ore, $934 in gold, 1,689 ounces of silver, and 7,282 pounds of lead, valued in all at $2,739. The ore yielded on the average $77.56 in metals a ton. Lead ore was shipped from the Little Fanny and Silver Wave properties, and a little gold was recovered by amalgamation at the Morning Glory mine. The placer output, valued at $645, came mainly from the Wilson placer on Indian Creek, although some gold was recovered from Boomerang Gulch and Grasshopper Creek.

CASCADE COUNTY

The value of the mine production of metals in Cascade County was $979,470, which is more than that of any other county except Silver Bow, which includes the Butte district. Except for a large quantity of old slag shipped from the smelter site, near Gibson below Great Falls, the output came from mines at or near Neihart.

The Anaconda Copper Mining Co. continued roasting, leaching, refining, and manufacturing operations at Black Eagle, near Great Falls. The electrolytic zinc plant treated zinc ore and concentrate

from Montana, Idaho, Utah, Nevada, Washington, and Canada, and made slab zinc at the rate of nearly 15,000,000 pounds a month. Since the plant began operations in 1916 many improvements have been made, and in June, 1925, construction was started which will increase the capacity to 20,000,000 pounds of fine zinc a month. Copper ore from the mines at Butte is milled and smelted at Anaconda, and the resulting copper anodes are shipped to the copper refinery at Black Eagle, where the pure copper is made into copper wire and bars. Zinc ore and lead-zinc ore from the Butte mines are milled at Butte or Anaconda, the resulting concentrate is roasted either at Anaconda or Black Eagle, and the calcines are treated in the electrolytic zinc plant at Black Eagle. The zinc residues from this plant, as well as lead concentrate from the mill at Anaconda, go to the lead smelter at East Helena, Mont. The production is given in the report on the Anaconda Copper Mining Co., under Silver Bow County.

Giant Springs district.—A large quantity of old slag, containing silver, copper, and lead, was shipped to East Helena from the smelter dump at Gibson.

Montana district (Neihart).—Nine lode mines in the Montana district produced 171,821 tons of ore yielding $14,860 in gold, 575,353 ounces of silver, 1,290,166 pounds of copper, 2,853,247 pounds of lead, and 101,960 pounds of zinc, valued in all at $853,340, or $4.97 a ton. The output consisted of 3,065 tons of first-class ore and 168,756 tons of mill ore which was reduced to 9,968 tons of concentrates. The Silver Dyke Mining Co., the largest producer, operated its 600-ton concentration-flotation plant continuously and shipped lead ore and copper-lead concentrate to East Helena and Anaconda. The property is one of the few important producers of silver, copper, and lead outside the Butte district. More than 4,000 feet of development work was done in 1925, and reserves of 1,000,000 tons of ore, containing approximately 5 ounces of silver to the ton, 1.5 per cent of lead, and 0.75 per cent of copper, are reported. The property, controlled by the American Zinc-Lead & Smelting Co., has enough ore developed to supply the mill for several years and has been a large producer since 1923. The ore is said to occur in gneiss and porphyry and is mined from a glory hole by the caving system. The other mines at Neihart were not actively operated, but a fair production of silver ore was shipped from the Big Seven and Florence properties. The Neihart Consolidated Silver Mining Co. made one shipment of silver-lead ore but was not able to operate profitably at the current price of silver, although it was a large producer in 1923 and 1924. One of the interesting features of the year was the shipment of lead-zinc ore to a custom milling plant. The Queen mine, under lease, produced several hundred tons of lead-zinc ore, which was reduced to a lead concentrate and a zinc concentrate at the Timber Butte mill at Butte. Crude ore and mill ore were shipped from the Dakota and Galt mines.

DEER LODGE COUNTY

The smelting and milling plants of the Anaconda Copper Mining Co., near Anaconda, were active throughout the year. Copper ore from Butte and custom material from mines throughout the State were either concentrated or directly smelted in the large copper plant, equipped with reverberatories and converters. The blast furnaces

were idle, and the copper leaching plant, built in 1915 to treat sand tailings, has been discarded since the advent of flotation. The mill for copper ore, completed in 1902, now has a capacity of 16,000 tons a day; in 1925 it treated an average of 9,000 tons a day. It is equipped for wet concentration and flotation and treated mainly company ore from Butte, but about 10 per cent of the feed was custom material. Lead-zinc mill ore was also concentrated at Anaconda, and the resulting concentrate was shipped to Black Eagle to be roasted in the electrolytic zinc plant. The zinc mill, built in 1916, has a daily capacity of 1,750 tons, and in 1925 treated daily about 1,400 tons of ore, which was mainly custom material. The mill is equipped with crushers, trommels, rolls, ball mills, classifiers, flotation machines, and thickening tanks. The results of smelting at Anaconda are given in the report of the Anaconda Copper Mining Co. under Silver Bow County.

Dry Gulch district.—Placer gold was recovered by sluicing glacial drift from the Dry Gulch placers on Modesty Creek, 16 miles north of Anaconda.

Georgetown district (*Southern Cross*).—Five lode mines in the Georgetown district produced 2,909 tons of ore yielding $31,943 in gold, 1,601 ounces of silver, and 2,067 pounds of copper, valued in all at $33,347, or $11.46 a ton. The output, which was less than that of 1924, came mainly from the Holdfast mine, which produced an oxidized iron ore containing gold. Similar ore was shipped from the Short Shift and Oro Fino properties, and silver ore was marketed from the Silver Reef mine. Several lots of low-grade ore containing gold and copper were shipped from the bins of the Cable mine, which was a large producer from 1883 to 1889 and from 1903 to 1906. The Southern Cross mine, a large producer of gold from 1902 to 1919, was not productive.

Oro Fino district.—One test lot of silver ore was shipped from the Cashier group, 8 miles from Race Track. Most of the output was silver ore from the Champion group and was treated in a 100-ton flotation plant. The property was closed September 1, but nearly 200 tons of rich silver concentrate was shipped to Anaconda. The company was a large producer of silver from 1921 to 1925 and is said to have reserves of 200,000 tons of ore, averaging 12 ounces of silver to the ton. In the mine, which is opened by more than 6,000 feet of development work, 400 feet of drifting was done in 1925.

FERGUS COUNTY

The value of the mine production of metals in Fergus County in 1925 was $11,147, a small amount when compared with the value of the output previous to 1921, when the Kendall, North Moccasin, and other large producers were operated.

Cone Butte district.—Test lots of silver ore were shipped to Anaconda from the Last Chance and Dardanelles claims.

North Moccasin district (*Kendall*).—Since the Barnes-King Development Co. disposed of its mining and milling property little has been done in the vicinity of Kendall. Some bullion, however, was marketed as a result of a clean-up at the old Moccasin mill, and some placer gold was recovered from the Kentucky claim.

Warm Springs district (*Giltedge*).—One placer and five lode mines in the Warm Springs district produced 163 tons of ore, $8,550 in gold, and 2,337 ounces of silver, valued together at $10,172. The ore yielded on the average $61.96 in metals a ton and consisted mainly of rich gold ore from the Spotted Horse mine, formerly a large producer. The mine is equipped with a 100-ton concentration and cyanidation plant, which was idle. Some development work was done, but, as the ore occurs in pockets, there is no large quantity in reserve. A small lot of rich gold ore was shipped from the Last Chance property, and several cars of silver ore were shipped from the Silver King and Silver Bell mines. One lot of gold ore was shipped from the Maginnis mine at Giltedge, which was under lease; the mine is equipped with an old 50-ton cyanide mill and was a large producer of gold in 1912. The Alpine Placer Association operated claims near Lewistown and produced a little gold. It did much development work and some testing, with the intent of freeing the gravel from clay and then treating it by amalgamation. The property is said to have 500,000 cubic yards of developed gravel.

GRANITE COUNTY

The value of the mine production of metals in Granite County increased from $62,861 in 1924 to $165,695 in 1925, due to increased shipments of ore from the mines at Philipsburg. In 1922 the mines of the county produced metals valued at more than $800,000.

Alps district.—One lot of gold ore from the Rainy Day mine, near Bonita, was treated in a small amalgamation mill.

Dunkleberg district.—The Butte & Western Mining Co., working the Forest Rose mine, shipped several cars of lead concentrate, as a result of tests made in a small concentration plant. Development work was done at the Gustafson property, and a test lot of oxidized lead ore was shipped to East Helena.

First Chance district (*Garnet*).—Three placers and five lode mines in the First Chance district produced 463 tons of ore, $11,018 in gold, 590 ounces of silver, and 162 pounds of copper, valued in all at $11,451. The ore yielded on the average $23.82 in metals a ton. Small lots of gold ore were shipped from the Gold Center, Shamrock, Montana, and Irene claims at Garnet. The largest production, however, was made by the Prafapo Mines Co. that operates the Mussigbrod mine; one lot of rich gold ore from the mine was shipped for smelting, and several hundred tons of ore was treated by amalgamation and concentration. Placer gold was recovered from Bear Gulch, Deep Gulch, and Ten-Mile Gulch, near Garnet.

Flint Creek district (*Philipsburg*).—Nine lode mines in the Flint Creek district produced 5,545 tons of ore yielding $15,073 in gold, 110,002 ounces of silver, 3,388 pounds of copper, 176,796 pounds of lead, and 203,149 pounds of zinc, valued in all at $122,715, or $22.13 a ton. Most of the output was that of the Granite Bimetallic Consolidated Mining Co. and the Philipsburg Mining Co., both large producers of silver ore in the past. First-class silver ore was shipped for smelting, and low-grade lead-zinc ore was shipped to the Timber Butte mill at Butte. Some oxidized lead ore and siliceous gold and silver ore was shipped from the Old Chief property, and silver ore,

with some lead ore, from the Trout mine, where more than 2,000 feet of development work was done in drifts, raises, and crosscuts. The Scratchall mine produced several cars of silver ore and some lead-zinc ore for custom milling. Other shipments were made by the Mullen Leasing Co., Last Chance, Londonderry, and Caledonia properties. A flotation plant is planned by the Maxville Gold & Silver Mining & Development Co., which is working the Londonderry mine.

Gold Creek district.—A little placer gold was recovered from the headwaters of Gold Creek, which runs north into Powell County.

Rock Creek district.—Three placers in the Rock Creek district produced $2,417 in gold and 37 ounces of silver, valued together at $2,442. Most of the output came from the Basin placer, formerly a large producer of gold, and other claims west of Philipsburg.

South Boulder district (Maxville).—One placer and two lode mines in the South Boulder district produced 2,541 tons of ore, $142 in gold, 7,114 ounces of silver, 101,159 pounds of copper, and 20,175 pounds of lead, valued in all at $21,199. The ore yielded on the average $8.33 in metals a ton. The Brook-Lead Mines Co. operated a 200-ton concentration-flotation plant and shipped several cars of lead concentrate rich in silver. Several hundred tons of copper ore was shipped from the Copper State or Hoffman property, operated by the Gold Coin Mining Co.

JEFFERSON COUNTY

The value of the mine production of metals in Jefferson County was $696,313 in 1925, as compared with $1,021,526 in 1924, when the Jib property at Basin made its record output of high-grade ore containing principally gold.

Amazon district.—Except for small lots of lead ore from the Alice and Cleveland properties, most of the output was sulphide lead ore and silver ore from the Bismark mine.

Boulder district.—Nearly 1,000 tons of silver ore was shipped from the Baltimore property by lessees. The remainder of the output consisted of a little lead ore from the Molly McGregor and Shiels & Ironside properties.

Cataract district (Basin).—Two placers and 18 lode mines in the Cataract district produced 67,155 tons of ore and old tailings, $230,528 in gold, 161,823 ounces of silver, 161,577 pounds of copper, 685,799 pounds of lead, and 348,376 pounds of zinc, valued in all at $451,919. The ore and old tailings yielded on the average $6.72 in metals a ton. The output consisted of 1,352 tons of first-class ore, 16 tons of ore treated in gold and silver mills, and 53,911 tons of mill ore which, with 11,876 tons of old tailings, was reduced to 6,316 tons of concentrates. As in 1923 and 1924, the largest producer was the Jib property at Basin, where copper-lead ore and siliceous gold ore, together with old tailings, were treated in a 300-ton concentration-flotation plant. The mine, which was the largest producer of gold in Montana in 1924, is opened by 6,800 feet of drifts and crosscuts and by four shafts, the deepest of which is down 600 feet. More than 1,500 feet of development work was done in 1925, but on July 24 the property passed from the Jib Consolidated Mining Co. to trustees for creditors, and thereafter the mill was not operated

at capacity. The property has two distinct veins, one containing galena, chalcopyrite, pyrite, and quartz, and a much richer one containing native gold and silver with sphalerite and other minerals. The Crystal mine was operated by lessees; silver ore and lead ore were shipped for smelting, and lead-zinc ore was treated at the Timber Butte mill at Butte. Old tailings from the dump of the Comet mine were also milled at Butte and reduced to lead and zinc concentrates. Several tons of sulphide-lead ore was shipped from the Hattie Ferguson property to the smelter at East Helena, and some lead-zinc ore was shipped to Butte for milling. Other producing properties were the Bullion, Jenny B., High Ore, Buckeye, Louise, and Morning Glory mines. Small test lots were shipped from the Silver Bell, Alexandria, Atlas, Atwater, and Morning Star claims. A little placer gold was recovered from the Winter Placer Diggings and other claims on Basin Creek.

Colorado district (*Wickes*).—Twenty lode mines in the Colorado district produced 26,470 tons of ore and miscellaneous material yielding $18,978 in gold, 102,515 ounces of silver, 58,701 pounds of copper, 567,336 pounds of lead, and 48,020 pounds of zinc, valued in all at $151,465, or $5.72 a ton. The output included 795 tons of old slag smelted besides 25,000 tons of old tailings and 311 tons of mill ore that yielded 3,198 tons of concentrates; it also included 224 tons of crude smelting ore and 40 tons of ore and 100 tons of old tailings treated in gold and silver mills. Several thousand tons of silver-lead concentrate was shipped by the Jefferson Milling Co., which operated two flotation plants on tailings from the old Alta mill, near Corbin. One mill ran from June to December; the other, which was erected, ran from October to the end of the year. The Mount Washington mine of the Angelica Mining & Development Co., a large producer of gold, silver, and lead in the past, especially in 1918 and 1919, sold comparatively little ore in 1925, although one car of lead ore was shipped to East Helena and several cars went to Butte for milling. Early in 1926 the Elm Orlu Mining Co., of Butte, took an option on the property and renewed energetic mining. Several hundred tons of slag was shipped from the old smelter dump at Wickes. Other producers were the Ariadne, Blizzard, Buckeye, Custer, Dorothy, Minah, Silver Tip, White Fawn, Willard, Bunker Hill, Minnesota, and Prize properties. Ore from the Willard, Bunker Hill, and Ariadne mines was shipped to Butte to be tested by flotation.

Elkhorn district.—Most of the output of the Elkhorn district was silver, with a little gold, contained in precipitates from the treatment of old tailings by the Western Metallurgical Co. (Ltd.). Old tailings deposited on the Elkhorn Bowden placer claims were treated in a 100-ton cyanidation plant. The plant ran from April 20 to December 18, and the dump still contains 100,000 tons of old tailings assaying about 4 ounces of silver to the ton. A little gold bullion, recovered by leaching at the Golden Moss mine, was marketed, and one car of copper ore was shipped from the Bulwer property.

Homestake district.—One small lot of silver ore was shipped from the Montana claim by a lessee and one car of gold and silver ore from the Evening Star property, near Homestake.

Lump Gulch district (*Clancey*).—Except for a little placer gold, the output consisted of one lot of silver ore from the Little Nell claim and some oxidized lead ore from the Revenue property.

McClellan district.—At the Oxide placer a small clean-up was made by sluicing old tailings and stream gravel.

Whitehall district.—Four lode mines in the Whitehall district produced 377 tons of ore yielding $4,862 in gold, 2,511 ounces of silver, 1,096 pounds of copper, and 69,681 pounds of lead, valued in all at $12,823, or $34.01 a ton. The output was first-class shipping ore and was mostly lead ore. Lessees worked the Carbonate and Sunny Corner claims and shipped several hundred tons of siliceous gold ore besides some oxidized lead ore. One car of gold ore was shipped from the Gold Hill mine and several lots of oxidized lead ore from the Parrott and Perhaps claims.

JUDITH BASIN COUNTY

Barker district (*Hughesville*).—Five properties in the Barker district produced 29,292 tons of ore and old slag, which yielded $9,080 in gold, 148,715 ounces of silver, 5,918 pounds of copper, 2,839,317 pounds of lead, and 3,315 pounds of zinc, valued in all at $360,401. The ore and slag yielded on the average $12.30 in metals a ton. The production of the Barker district, in which there was a large increase, was the total for Judith Basin County; it consisted of 465 tons of first-class ore and 1,308 tons of old slag smelted, and 27,519 tons of mill ore that yielded 7,467 tons of concentrates. Most of the output, as in recent years, was made by the Block P. Mining Co., working the Barker, Wright & Edwards, and Gray Eagle mines at Hughesville. The company operated a 100-ton concentration mill most of the year and shipped more than 7,000 tons of silver-lead concentrate. The ore contains galena, sphalerite, and pyrite, and the mill makes two grades of concentrate, one high in silver and lead and the other high in iron but low in silver and lead. In 1925 the company ranked fifth among the lead producers in Montana. Several cars of silver-lead ore were shipped from Monarch by the New Liberty Mining Co., and one car of oxidized lead ore was marketed from the Emerald mine. Slag, containing more than 5 per cent of lead with a little silver, was shipped from the old Barker dump.

LEWIS AND CLARK COUNTY

The value of the mine production of metals in Lewis and Clark County in 1925 was $180,752, or 18 per cent less than in 1924. A marked change was made in the production of the county by the closing of the Shannon mine at Marysville in 1923.

Regular smelting operations were continued at the lead plant of the American Smelting & Refining Co. at East Helena, and about 6,000 tons of bullion a month was shipped east for refining. Custom material from Montana and Idaho was treated; much of the charge was sulphide lead material from the Coeur d'Alene region of Idaho. Residues from the zinc plant at Black Eagle constituted a large part of the receipts from Montana. Parsons [2] gave a description of the

[2] Parsons, A. B., "Notes on western lead smelters": Eng. and Min. Jour.-Press, vol. 119, May 30, 1925, p. 883.

general features of the plant. The ore is bedded, and the sulphide material is roasted in two stages in eight Dwight-Lloyd sintering machines. The plant has four blast furnaces, a bag house, and a Cottrell plant. There is no matte fall from the blast furnaces, but the dross from the bullion kettles is skimmed and treated in a small reverberatory furnace. Doré bullion goes east for refining, and matte containing copper is shipped to Tacoma, Wash. The slag contains about 13 per cent of zinc, and there is a large accumulation of this rather high-grade material on the dump. The problem of saving part of this zinc is being studied by the company's engineers. Another article [3] giving the history and describing the equipment of the plant was published in December.

Bald Butte district (*Marysville*).—The Bald Butte Mining & Milling Co. was virtually idle, but a little bullion was saved through the operation of one battery of the 40-stamp mill. Some oxidized lead ore and a little gold-silver bullion saved by cyanidation were shipped from the Larson group. A large body of silver-lead-zinc ore of good grade is said to have been opened on this property, but it has not been tested for milling.

Big Blackfoot district (*Silver*).—One lot of copper ore, containing silver and a little gold, was shipped from the Midnight Copper property.

Dry Gulch district.—One car of lead ore was shipped to East Helena from the Dudley property, near Canyon Ferry. Bullion containing gold valued at $1,150 and 7 ounces of silver was recovered from placer mines, mainly from the Jim Town and Sprat claims in Kingsbury and York Gulches, which were worked by drifting.

Gould district.—Some gold ore from the Jay Gould property was treated by amalgamation, and the resulting bullion was shipped to the assay office at Helena. Late in the year the mine, which was once a large producer, was rejuvenated by the New Gould Mining Co., and early in 1926 a mill reconstructed from the old Hubbard plant and operated regularly.

Grass Valley district.—Eight lode mines in the Grass Valley district produced 185 tons of ore, which yielded $312 in gold, 6,581 ounces of silver, 518 pounds of copper, and 8,348 pounds of lead, valued in all at $5,679, or $30.70 a ton. All the output was first-class smelting ore, and most of it was silver ore from the Silver Coin property, which produced several cars of ore shipped from Rheem Spur to the East Helena smelter. Other small lots came from the Silver Bell, Carbon Hill, Gray Eagle, Nora Darling, Stem Winder, and Curlew claims.

Greenhorn district.—One small lot of gold ore was shipped from the Umatilla property and some gold ore was also treated in a small amalgamation mill.

Heddleston district (*Silver*).—The Mike Horse mine was worked a short time by lessees. The 100-ton concentration-flotation mill was idle, but several cars of sulphide lead ore were shipped to East Helena and some lead-zinc material to the Timber Butte mill, south of Butte. The property has in reserve about 22,000 tons of ore said to average 4 ounces of silver to the ton, 5 per cent of lead, and 4 per cent of zinc.

[3] Mining Truth, Dec. 1, 1925. p. 33.

Helena district.—A little placer gold was saved from Grizzly Gulch and other gulches near Helena.

Lincoln district.—Placer gold was recovered by sluicing gravel at the Harvey and Bloom properties, near Lincoln.

Ottawa district (*Marysville*).—Three placers and six lode mines in the Ottawa district produced 16,333 tons of ore, $110,089 in gold, 22,715 ounces of silver, 2,772 pounds of copper, and 29,341 pounds of lead, valued in all at $128,800. The ore yielded on the average $7.87 in metals a ton. Although large, the production was much less than that of 1923, when the Shannon mine was still active. All the ore output, with the exception of 115 tons of smelting ore, was treated in gold and silver mills, mostly by cyanidation. The largest part of the district output was gold and silver from the Drumlummon mine, operated by the St. Louis Mining & Milling Co. of Montana. Considerable bullion was saved through the operation of a 100-ton cyanidation plant that was continuously busy. The mine is opened by a tunnel 1,300 feet long and two shafts 1,200 feet deep, but there is not much ore in reserve, and the mill ran mainly on old waste and ore from old pillars. The Barnes-King Development Co., which worked the Shannon and Piegan-Gloster mines from 1915 to 1923, was unable to find other desirable mining property. The machinery and other property at Marysville and Kendall were therefore sold, a liquidation disbursement of $296,000 paid to stockholders, and the company dissolved. A little gold ore was treated by amalgamation from the Bald Mountain mine, formerly a large producer of both gold and silver, and several cars of ore were shipped from the Towsley and Big Ox properties. Placer gold and silver valued at $230 were recovered from the Good Enough and other claims in Uncle Ben and Last Chance Gulches. Some of this gold, which is found in fairly large nuggets, is sold in Helena for jewelry.

Scratch Gravel district.—Small lots of gold ore were shipped for smelting from the General Harrison and Whiteside properties, and a little placer gold was recovered in the Scratch Gravel Hills.

Stemple district.—A five-stamp mill ran a short time on ore from the Klondyke property, and one lot of gold ore was shipped from the Marcheta mine.

Unionville district.—Gold bullion recovered by placer methods from mill débris at the Whitlatch property was sold to the assay office at Helena.

Vaughn district (*Rimini*).—One placer and nine lode mines in the Vaughn district produced 266 tons of ore, $3,661 in gold, 8,906 ounces of silver, 1,348 pounds of copper, 138,380 pounds of lead, and 9,178 pounds of zinc, valued in all at $22,769. The ore yielded on the average $77.52 in metals a ton. Except for one lot of ore shipped for milling, the output was first-class silver-lead ore. Several cars of sulphide lead ore were shipped from the Loeber Lode and Little Lily properties at Rimini, and small lots of lead ore were shipped from the Peerless Jennie, Lee Mountain, Anna May, and Valley Forge properties. The Stanton mine produced one lot of lead ore, and a car of lead-zinc ore was shipped to Butte for milling. At the Porphyry Dike property, which has a large deposit of low-grade gold ore opened by trenches and a glory hole, the 300-ton amalgamation mill was idle. The Gould placer was worked by the

Red Mountain Hydraulic Co., which recovered bullion valued at more than $2,000.

Wolf Creek district.—The Montana Copper & Zinc Co., owning the New Era group, shipped a car of oxidized copper ore to Anaconda. About 1,500 feet of drifting has been done in the past and 200 feet of development work was done in 1925.

LINCOLN COUNTY

The value of the mine production of metals in Lincoln County decreased from $143,705 in 1924 to $80,274 in 1925, as the output from mines at Troy and Libby was comparatively small.

Libby district.—The output consisted of two small lots of lead ore shipped from the Lukens Hazel and Silver Mountain properties. Lead-silver concentrate was shipped from the Lukens Hazel property, south of Libby, from 1921 to 1924, but the mine and mill were afterward closed on account of litigation.

Troy or Callahan Creek district.—Development work was carried on at the Snow Storm mine at Troy, but the mill ran only three months. The plant is equipped with crushers, rolls, Hardinge mills, classifiers, tables, and flotation machines. Lead concentrate was shipped to East Helena, and zinc concentrate was exported to Belgium. The mine is opened by more than 6,000 feet of drifts, tunnels, and shaft work. During 1925, 1,250 feet of drifts and crosscuts were run, and a three-compartment shaft was sunk 240 feet. As the ore found recently in the Snow Storm mine has not taxed the capacity of the large and modern concentration-flotation plant, it was planned early in 1926 to purchase and mill custom ore from mines in Montana, Washington, British Columbia, and Idaho. A market may thus be found for the lead-zinc ore of the Big Eight mine on Callahan Creek, where a 7-foot body of mill ore has been developed.

MADISON COUNTY

The value of the mine production of metals in Madison County increased from $73,822 in 1924 to $216,609 in 1925, due in large part to the activity at the Liberty-Montana mine, south of Jefferson Island. From 1902 to 1922 the county yielded a large quantity of gold through the work of dredges in Alder Gulch, but the placer output is now small, as no dredges were operated in the State in 1925.

Alder Gulch district (*Virginia City*).—Five placers and five lode mines in the Alder Gulch district produced 699 tons of ore, $15,325 in gold, and 4,499 ounces of silver, valued together at $18,447. Gold and silver from placers were valued at $8,923, and the ore, which yielded on the average $13.63 in metals a ton, consisted of 139 tons shipped for smelting and 560 tons treated in gold and silver mills. Several cars of rich gold ore were shipped from the High Up property, and one lot of silver ore was shipped from the U. S. Grant mine. Precipitates containing gold and silver were saved by treating dump ore by cyanidation. Test lots of ore were shipped from the Bamboo Chief and Wakusta claims. Placer gold was recovered from the Alder Gulch group, the Eggert placer, and from the old

Conrey property, a large producer of gold from 1902 to 1922 through dredge operations.

Camp Creek district.—Several hundred tons of oxidized lead ore was shipped to the smelter at Midvale, Utah, from the Calvin property, east of Melrose. The property, which was worked part time under lease, is opened by about 350 feet of tunnels and winzes.

Lower Hot Springs district (Norris).—Five lode mines near Norris produced small lots of ore, yielding metals valued at $1,423; the largest lot was from the Josephine property. Sample lots of silver ore came from the Silver Star, Stratton, and Morning Star mines.

McCarthy Mountains district.—One lot of oxidized silver-lead ore was shipped from the Polly Jane group, near Twin Bridges, and several cars of especially rich gold ore were shipped from the Hidden Treasure mine, owned by the Bieber Keith Mines Co.

Mineral Hill district.—Nearly all the output of the Mineral Hill district was copper ore from the Mammoth mine, worked by the Liberty-Montana Mines Co. A 100-ton concentration-flotation plant was active most of the year, and copper concentrate containing considerable gold and silver was shipped to Anaconda. A sulphide zone in schist is opened by 6,000 feet of tunnels, and 570 feet of work was done in 1925. A little gold bullion and some concentrate were shipped from the Strawberry property, probably from former operations.

Norwegian district.—The Parish Mining Co. operated the Norwegian property at Pony, and placer gold was shipped to the mint at Denver, Colo.

Rabbit district.—Eight lode mines in the Rabbit district produced 246 tons of ore, which yielded $3,301 in gold, 2,873 ounces of silver, 453 pounds of copper, and 50,317 pounds of lead, valued in all at $9,737, or $39.58 a ton. All the output was first-class smelting ore, consisting mainly of oxidized lead ore from the Emma mine, which is developed by several shafts to a depth of 400 feet. Other producers were the Saturday Night, Monitor, King, Cordell, Cooper, and California claims.

Ramshorn district.—Four placers and three lode mines in the Ramshorn district produced 24 tons of ore, $1,854 in gold, 525 ounces of silver, and 2,739 pounds of lead, valued in all at $2,457. The ore yielded on the average $66.25 in metals a ton. The placer output, consisting of $859 in gold and 11 ounces of silver, was recovered from the McKay claim in Bivens Gulch, the Gold placer near Sheridan, and other claims in Harris Gulch and Browns Gulch. Small lots of gold ore were shipped from the Betsy Baker and Mohawk properties, and one small lot of sulphide lead ore was marketed from the Bedford claim.

Red Mountain district.—The McCauley placer, east of Melrose, produced placer gold that was sold to a bank at Butte.

Sheridan district.—Ten lode mines in the Sheridan district produced 1,875 tons of ore, which yielded $5,871 in gold, 5,657 ounces of silver, 62 pounds of copper, 80,573 pounds of lead, and 106,512 pounds of zinc, valued in all at $24,911, or $13.29 a ton. The output consisted of 282 tons of ore treated in gold and silver mills, 27 tons shipped to smelters, and 1,566 tons of mill ore reduced to 223 tons of concentrates. The largest producer was the Buckeye mine, from which considerable lead-zinc ore was marketed through the opera-

tions of lessees. The ore was reduced to lead concentrate and zinc concentrate at the Timber Butte plant at Butte. The mine was operated only 30 days, but a large body of low-grade lead-zinc ore was said to have been opened. Rich ore from the Tamarack group was treated by amalgamation and concentration, but the mill ran only a short time. The mine is opened by nearly 3,000 feet of development work, and a large quantity of low-grade gold ore is said to be in reserve. One lot of rich gold concentrate was marketed from the Gladstone mine, oxidized lead ore from the Latest Out, and some gold bullion from the Noble, Osternich, and Paymaster properties. The Smuggler Mining Co., working the Emma B. property, retimbered all the workings, sacked ore for future shipment, and mined 1,500 tons of ore that was put on the dump. A 50-ton mill is planned.

Silver Star district.—Eight lode mines in the Silver Star district produced 163 tons of ore, which yielded $3,365 in gold, 210 ounces of silver, 857 pounds of copper, and 8,728 pounds of lead, valued in all at $4,392, or $26.94 a ton. Except for 18 tons of ore treated by amalgamation, all the output was shipping ore. Several lots of gold ore were shipped from the Edgerton, Greene-Campbell, and Lolita claims. A small mill handled ore from the Strawn group, and some gold bullion was shipped to the assay office at Helena. Other small producers were the Hudson, King Fisher, Judge Law, and Keynote claims.

Summit district (Virginia City).—Four lode mines in the Summit district produced 1,055 tons of ore and old tailings, which yielded $5,406 in gold, 2,260 ounces of silver, 50 pounds of copper, and 1,333 pounds of lead, valued in all at $7,097, or $6.73 a ton. The largest part of the output was made by the E. M. Smith Mining Co., which worked the Highland Chief and other claims, 8 miles from Alder. Gold bullion and a little lead concentrate resulted from the operations of the 10-stamp mill which is equipped for amalgamation and concentration; the company also treated several hundred tons of old tailings by cyanidation. Ore reserves were reported to be 9,000 tons of gold ore, and development consisted of 200 feet of new tunnel work. Some gold bullion and rich gold concentrate were marketed from the Winnetka mine, near Virginia City.

Tidal Wave district (Twin Bridges).—Twelve lode mines in the Tidal Wave district produced 237 tons of ore which yielded $1,871 in gold, 3,022 ounces of silver, 1,574 pounds of copper, 141,303 pounds of lead, and 10,773 pounds of zinc, valued in all at $17,305, or $73.02 a ton. The output consisted of 207 tons of crude smelting ore and 30 tons of concentrating ore. Several lots of oxidized lead ore of good grade were shipped from the Ella and Dutchland mines. A test lot of lead-zinc milling ore was shipped from the June and Texas properties, rich gold ore from the High Ridge and Lottie claims, and a little silver ore from the Keynote mine. Small lots were also shipped from the Van Meter, Woodpecker, and Democrat claims.

Upper Hot Springs district (Norris).—Several lots of rich gold ore were shipped to Anaconda from the Bull Moose and Blue Grouse claims.

Washington district.—The Twin Lakes, Lone Star, and Lehigh properties each produced small lots of gold ore for smelting.

MEAGHER COUNTY

Beaver Creek district.—A little placer gold was recovered from the Klondyke, Geho, and other claims on Beaver Creek, 7 miles northwest of Watson.

Castle Mountain district.—The output consisted of a little lead slag from the dump of the Cumberland mine and sulphide lead ore from the Homestake group, owned by the Castle Mountain Mines (Inc.). The company has done drifting and raising and expects to be on a milling basis in 1926.

Little Belt district.—One lot of gold ore was shipped from the Jack Pine claim. The shipping point is White Sulphur Springs, on the Chicago, Milwaukee & St. Paul Railroad.

MINERAL COUNTY

The value of the mine production of metals in Mineral County increased to $41,412, chiefly because of the resumption of work at the Iron Mountain mine, north of Superior.

Cedar Creek district (*Iron Mountain, Quartz*).—Ten placers and one lode mine in the Cedar Creek district yielded 70 tons of ore, $4,411 in gold, and 8 ounces of silver, valued together at $4,417. The American Gold Mining Co. made a mill-run on low-grade gold ore, but the concentrate was not marketed, and only a small quantity of bullion was sold. The placer output, valued at $4,382, from Quartz Creek, Cedar Creek, and their tributaries, came mainly from the Meadow Creek, Windfall, Dakota, and Henrietta claims. The Last Chance, Lulu, Kelly, Stockholm, and Stemwinder placers also yielded gold. The Intermountain mine, formerly a producer of copper ore, was idle.

Iron Mountain district (*Superior, Iron Mountain*).—The Iron Mountain mine, 4 miles north of Superior, was leased from the Federal Mining & Smelting Co. and worked by the Iron Mountain Mining Co. The property is opened by 9,200 feet of tunnel and shaft work and was a large producer of lead and zinc from 1913 to 1917. A 150-ton flotation plant was rebuilt and operated from November 1 to the end of the year. Lead concentrate was shipped to the smelter at East Helena, and zinc concentrate was exported to Belgium. The company reports 100,000 tons of ore in reserve, estimated to contain 8 per cent of zinc, 1.75 per cent of lead, and 2 ounces of silver to the ton.

St. Regis district.—The Lenora Gold Mining Co. treated a little low-grade gold ore in its 25-ton amalgamation mill. The Amazon Dixie Mining Co., which has done about 17,000 feet of underground work, continued development by 1,150 feet of crosscuts and drifts as well as sinking a 2-compartment shaft 125 feet. A large body of ore containing silver, copper, and lead has been opened on the 1,500-foot level.

Saltese district.—About 400 feet of development work was done at the Tarbox mine, which is said to have more than 400,000 tons of mill ore developed carrying silver, lead, and zinc.

MISSOULA COUNTY

The value of the mine production of metals in Missoula County increased to $44,097, as a result of shipments of lead ore from property near Clinton.

Ninemile district.—Placer bullion, valued at $793, was saved from the Marion Creek and another placer claim near Stark.

Wallace district.—The Hidden Treasure property on Wallace Creek, 2½ miles north of Clinton, was operated by a lessee, and more than 1,500 tons of oxidized lead ore and copper ore, containing considerable gold and silver, was shipped to Anaconda and East Helena.

PARK COUNTY

The value of the mine production of gold and silver in Park County increased from $209,904 in 1924 to $294,248 in 1925, as a result of increased shipments of bullion and calcines from the Jardine mine, 6 miles northeast of Gardiner, the north entrance to Yellowstone National Park.

New World district (Cooke).—Development work continued at the Glengarry, Western, and Irma properties. The management of the Western Smelting & Power Co. gave notice again that the smelting plant at Cooke City might run during the summer, but it remained inactive. The possibility of economically operating a smelter at this point, 50 miles from a railroad, is questioned by engineers who have visited the property.

Sheepeater district (Jardine).—The Jardine Mining Co. operated its mine and mill throughout the year. A 40-stamp mill, having a capacity of 200 tons a day, treated ore which contains gold, arsenic, iron, and tungsten. A large output of gold saved by amalgamation was shipped to the assay office at Helena, and the calcine from a rich gold-bearing concentrate, saved on tables and in flotation machines, was shipped to East Helena. The mine is equipped with an arsenic plant, which was active in 1925, and a 12 by 20 foot reverberatory furnace was added during 1925. A cyanidation plant was also constructed, so that the calcines or roasted concentrate could be treated locally instead of being shipped to a smelter, and a 30-foot Dorr thickener was installed in the mill. An article [4] giving the history of the mine, the occurrence of the ore, and the equipment of the mill and sublimation plant appeared in November. The following paragraphs are taken from the company's annual printed report for 1925:

> A larger tonnage was mined and milled than in previous years, and notwithstanding the lower price obtained for arsenic the total gross earnings exceeded those of 1924 by $80,000.
>
> Approximately 1 mile of drifts, crosscuts, and raises were driven during the year in the development of ore bodies and making ore available for stoping. No difficulty was found in keeping the mill supplied with ore, notwithstanding 44 per cent more ore was treated than in 1924. In the north end of the mine especially large development was carried on with satisfactory results. * * *
>
> The mill was operated continuously with the exception of three holidays. In addition to keeping up the regular repair work, a number of improvements and installations of new equipment were made. Among these were additional concentrating tables and flotation machines. An addition to the mill was built to

[4] Robie, E. H., "Producing gold and arsenic at Jardine, Mont.": Eng. and Min. Jour.-Press, vol. 120, Nov. 14, 1925, p. 765.

make room for a 38-foot by 8-foot Dorr thickener. The purpose of this thickener is to partially dewater the ore pulp after table concentration and regrinding. * * * The result of the improvements is the treatment of a larger tonnage of ore at a lower cost per ton, with increased recovery of gold and arsenic.

Additions to the arsenic plant consisted of an additional reverberatory refining furnace with hearth 12 by 20 feet, one cylindrical steel cooling chamber 6 feet in diameter by 30 feet high, and three concrete-and-brick condensing kitchens each 10 by 10 feet by 30 feet high. * * *

While the improvements in the arsenic plant during the last two years have cut the cost of production 49 per cent, the profit from arsenic production has decreased, as the price dropped from 5¾ cents per pound at the beginning of the year to 3¼ cents per pound on December 31. * * *

During the year tests were made in cyaniding the calcines which have heretofore been shipped and sold to the smelters for their gold content. Calcines are the concentrates after the arsenic is roasted from them. Straight percolation was first tried, but it was found that a satisfactory saving of the gold could not be made by that method. Additional equipment was installed, and the plant started about the end of the year.

As now being operated (February, 1926) the plant is as follows: A screw conveyor takes the calcines from a storage bin and discharges them into an agitating tank filled with a solution of cyanide of sodium. The calcine, mixed with the cyanide solution, is pumped to a ball mill in the cyanide plant where it is ground to 150-mesh and discharged into a Dorr thickener. The material is allowed to settle in this thickener, and the clear cyanide solution is decanted and run through boxes filled with zinc shavings on which the gold is deposited. The thickened pulp is pumped to Pachuca tanks, where it is agitated with compressed air together with cyanide solution and again allowed to settle. The solution is again drawn off and put through the zinc boxes as before. This agitation and decantation is repeated several times with weak solution until a sufficient extraction of the gold has been made. Before discharging the tailings from the plant they are run over a concentrating table to extract the small percentage of scheelite, the valuable tungsten mineral, which is in the ore.

The gross earnings were $392,399, including $257,935 from gold in bullion and concentrates, and $130,506 from arsenic sales. The operating profit was $43,447, from which a dividend of $21,844 was paid.

PHILLIPS COUNTY

Little Rockies district (*Landusky*, *Phillips*).—Both the Ruby Gulch and August mines, at Zortman, were idle, but a little bullion, containing gold and silver, was cleaned up from operations of the Unit Leasing Co. In 1923 the mines of this district produced gold and silver valued at $286,803.

POWELL COUNTY

The mine production of metals in Powell County was valued at $17,773 in 1925. It has been steadily declining since 1922, when the mines produced $49,158.

Big Blackfoot district.—Stream gravel from the Gold Dust placer was treated by sluicing and hydraulic mining, and some placer gold was shipped to the assay office at Helena.

Blossburg district.—One lot of gold ore was shipped from the Myles property near Schatz.

Mary Ann district.—In the course of development work the Gray Rock mine produced one small lot of silver-lead ore.

Nigger Hill district.—Six lode mines in the Nigger Hill district produced 44 tons of ore, which yielded $967 in gold, 1,624 ounces of silver, 34 pounds of copper, and 29,385 pounds of lead, valued in all

at $4,656, or $105.82 a ton. The largest producers were the Carbonate Boy and Black Jack properties, near Elliston. Small lots were shipped from the Big Dick, Flora, Montana, and Newport claims.

Ontario district (Elliston).—The mine production of metals in the Ontario district was valued at $3,683, chiefly for placer gold from the Billy Boy, Pioneer, McKay, and Eddy claims, near Elliston. The Charter Oak mine, opened by 500 feet of tunnels, produced one small lot of silver-lead ore.

Pioneer district (Gold Creek).—Three placers in the Pioneer district produced $1,394 in gold and 12 ounces of silver. At the Friday and Pioneer claims, on Gold Creek, placer gold was recovered by treating bench gravel with hydraulic giants.

Snowshoe district.—A test lot of oxidized copper ore was shipped from the Opportunity claim, on Snowshoe Creek, 11 miles north of Elliston.

Washington Gulch district.—The Madison Creek and Fontana properties were worked a short time during the summer, and placer gold was shipped to the assay office at Helena.

Zozell district.—One car of sulphide lead ore was shipped from the Bonanza claim and some lead ore, rich in gold and silver, from the Blue Eyed Maggie property.

RAVALLI COUNTY

Curlew district.—Development work was done at the Curlew property, where much tunneling and shaft sinking has been done in the last three years. Besides the mine ore, there is a large dump of old tailings which was being tested in a 150-ton concentration-flotation mill.

Hughes Creek (Overwich) district.—Some gold ore from the Pathfinder group, near Darby, was treated in an arrastre. A little placer gold was mined from the Cow Creek and Hughes Creek claims. Tests for possible dredge operations were made by the Montana-Washington Mines (Inc.).

Pleasant View district.—The Pleasant View mine, near Victor, which is opened by a shaft 200 feet deep and a tunnel 300 feet long, produced one car of silver ore.

SANDERS COUNTY

The value of the mine production of metals in Sanders County, part of which borders on the Coeur d'Alene region of Idaho, rose from $3,006 in 1924 to $13,485 in 1925.

Blue Creek district.—Some lead-zinc ore was shipped to Portland, Oreg., for export from the Broken Hills Silver-Lead property, five miles from Heron, which was worked under lease. The property is opened by 1,500 feet of tunnels and drifts.

Revais Creek district.—One car of oxidized copper ore, containing gold and silver, was shipped from the Dixon mine, 6 miles from Dixon, on the Northern Pacific Railroad.

Thompson River district.—Three lode mines in the Thompson River district produced 62 tons of ore, which yielded $8 in gold, 2,901 ounces of silver, 16,055 pounds of copper, and 19,553 pounds of lead, valued in all at $6,002, or $96.81 a ton. One lot of copper-

lead ore, containing considerable silver, was shipped from the Silver King mine. Sulphide copper ore was shipped from the Copper Mask and Copper King mines on Thompson River, 10 miles from Thompson Falls.

SILVER BOW COUNTY

Forty-eight mines in Silver Bow County were productive in 1925, but most of the metal output resulted from the operations of 10 companies. Nearly all the large producing mines at Butte were active throughout the year, as is shown by the increased production of copper. Efforts, however, were confined to reducing costs and improving metallurgic results rather than making a record output. The larger part of the ore mined or treated was concentrated at milling plants at Butte and Anaconda; the resulting products consisted of copper concentrates, lead concentrates, copper-lead concentrates, zinc concentrates, and lead-zinc concentrates, which yielded metals valued at $54,057,915, or $37.38 a ton of concentrates. The crude smelting ore yielded on the average $16.25 in metals a ton. No ore was treated by amalgamation or cyanidation, but 60,754 tons of old copper tailings and slime-pond material were smelted. Of the total output of ore and old tailings in the county 82 per cent was classified as copper material.

Mine production of gold, silver, copper, lead, and zinc in Silver Bow County, Mont., in 1925

	Number of producers	Ore and old tailings	Gold [1]	Silver [1]	Copper	Lead	Zinc	Total value
		Short tons		*Fine ounces*	*Pounds*	*Pounds*	*Pounds*	
1925	48	3,862,401	$748,152	11,568,302	[2] 266,636,957	24,182,202	113,779,921	$57,390,128
Increase or decrease from 1924	+3	−329,970	+16,545	−291,068	+19,272,002	−3,115,087	−14,055,966	+5,814,818

[1] Includes placer production. [2] Includes 4,804,364 pounds of copper recovered from precipitates.

Divide Creek district (Melrose).—The output of the Divide Creek district consisted of a small car of gold ore from the Alice claim, 6 miles from Melrose, and a car of high-grade silver ore from the Gallinipper mine.

German Gulch district.—Placer gold recovered from claims in German Gulch was sold through banks at Butte, but no regular mining was done.

Independence district.—The Butte & Burlington Mining Co. worked the Montana, Black Warrior, and Tiger claims, west of Butte, which are opened by a shaft 160 feet deep and 1,200 feet of drifts and crosscuts. A small test lot of silver ore was shipped to Anaconda.

Summit Valley or Butte district.—Forty-four lode mines in the Summit Valley district produced 3,862,339 tons of ore and old tailings, which yielded $746,422 in gold, 11,561,659 ounces of silver, 266,636,957 pounds of copper, 24,182,202 pounds of lead, and 113,779,921 pounds of zinc, valued in all at $57,383,788. Excluding

the value of the copper recovered from precipitates, the ore and old tailings yielded on the average $14.68 in metals a ton. The output consisted of 133,265 tons of first-class ore, 60,754 tons of old tailings smelted, and 3,668,320 tons of concentrating ore reduced to 1,446,340 tons of concentrates.

The mines of Butte have made a marvelous record for more than 40 years. Geologists employed in the district report that there is strong evidence of the permanency of the camp, judging from the size and richness of the ore bodies at a depth of 3,800 feet.

From the beginning of activities in 1882 to the end of 1925, Silver Bow County, which includes the Butte district, has yielded gold, silver, copper, lead, and zinc valued at $1,898,921,747, as follows: Gold, $34,453,350; silver, $302,646,634; copper, $1,377,864,557; lead, $14,496,242; and zinc, $169,460,964. These values represent 1,666,680.76 ounces of gold, 411,369,874 ounces of silver, 8,889,451,809 pounds of copper, 215,176,039 pounds of lead, and 1,990,498,032 pounds of zinc.

The mines of the Anaconda Copper Mining Co., according to the printed annual report for 1925, produced 2,847,158 tons of copper ore and 7,990 tons of precipitates, a total of 2,855,148 tons in 1925 against 3,098,805 tons in 1924. The concentrator treated 2,999,892 tons of copper ore and 16,079 tons of copper tailings. The copper-reduction works at Anaconda treated, for all companies, 3,145,627 tons of copper ore and other cupreous material. Of this material 2,750,736 tons came from company mines, 363,812 tons was either purchased from or treated for other companies, 27,984 tons came from old plants at Anaconda and Great Falls, and 3,095 tons from the zinc plant at Great Falls. The Anaconda works produced 266,864,833 pounds of fine copper, 9,071,360 ounces of silver, and 38,390.32 ounces of gold, and the greater part of this output came from the copper mines of the Anaconda Copper Mining Co. at Butte.

The company owns or controls at Butte about 1,200 acres of mineral land, consisting of many old mines directed by one general management, but divided, for convenience of operation, into four groups. Ore reserves are not made public, but it is understood that enough ore is developed to supply the mills at Anaconda for many years. Selective mining is used, and the management is extremely careful not to mine ore for milling that contains less than 3.50 per cent of copper. The first-class smelting ore contains about 5 per cent or more of copper. Although the costs of mining, milling, smelting, and refining are not published, it is agreed that copper recovered from the mine-water precipitate is the cheapest copper produced from the Butte mines. Copper-bearing water pumped from the mines at the rate of 5,000 gallons a minute is raised to the surface at two large pumping stations at the Leonard and High Ore mines and is allowed to flow over quantities of scrap iron ranging in size from steel rails to tin cans. The Mines Handbook [5] gives interesting details regarding the development of the various mines and the equipment of the metallurgical plants, but the latest figures of production were those of 1923. Development work up to 1922 consisted of 2,200 miles of underground workings, which are being

[5] Weed, W. H., The Mines Handbook, vol. 16, 1925.

extended at the rate of about 20 miles a year. The following statements were taken from a pamphlet called The Copper Target, which was issued by the company in 1924 to show the expense and difficulties attending the mining of copper ore as compared with the production of nonmetallic mineral such as coal:

> The company mines, let us say, a ton of ore containing 3½ per cent of copper. From this it will recover 63 pounds of metallic copper, which, at the price prevailing at this writing (13 cents a pound), will produce $8.19. Two ounces of silver, at 68 cents an ounce, will bring $1.36, which, with 15 cents worth of gold, will give a total of $9.70 at New York from the ton of ore mined.
>
> Thus it is up to the Anaconda company to support itself and make a profit out of mining, reducing, refining, freighting, and selling the metals in a ton of $9.70 ore, taken from the earth 1,500 feet or more below ground. Extensive preliminary work is first necessary. Then it must handle at least an additional ton of waste rock to get at the ore, keep great engines at work to hoist the ore and lower men and material, pump compressed air hundreds of feet into the depths to operate the drills, install electric equipment for ventilation, lighting, and the moving of underground trolleys, timber the mines, fill the vacant spaces with rock, ship its ore 25 miles for smelting, reduce it, again ship it 175 miles to the refinery, and finally transport its finished billets or ingots thousands of miles to the Atlantic seaboard and there sell them at a price which may be lower than $9.70.

The electrolytic copper refinery at Great Falls produced 210,552,163 pounds of cathodes, most of which were melted into shapes at Great Falls. The rod mill at Great Falls rolled into rods 133,851,764 pounds of copper; 40,867,277 pounds of rods were drawn into wire, of which 14,453,655 pounds were made into strand. In addition to the rods used locally, 43,041,411 pounds of rods were shipped to the Kenosha plant of the American Brass Co. to be drawn into wire. The zinc plants at Anaconda and Great Falls treated 508,786 tons of ore and other zinciferous material; 26,065 tons of the total was produced by mines of the Anaconda company, and 482,721 tons of ore and concentrates were purchased from other companies. The plant at Great Falls produced 161,795,891 pounds of electrolytic zinc, 8,414,359 pounds of zinc in dross, 105,200 pounds of cadmium, and residue from which 20,626,664 pounds of lead, 1,365,762 pounds of copper, 2,631,494 ounces of silver, and 6,368.93 ounces of gold were recovered. Lessees shipped first-class silver ore from the Alice mine, and much milling ore from the Rising Star, Magnolia, Magna Charta, and Curry claims was concentrated at Butte. Dividends amounting to $9,000,000 were paid in 1925 by the Anaconda Co., and the net income for the year was $17,540,532, which, added to the balance at the end of the year 1924, gives a surplus of $83,061,197 after deduction of dividends.

The company continued its work in the lumber industry, mined coal, and manufactured metal roofing, arsenic, sulphuric acid, and fertilizer. It also did a large business in copper, brass, and nickel-silver at the plants of the American Brass Co. and operated mines, mills, and smelters through its subsidiaries in Arizona, California, Utah, Illinois, Ohio, and Indiana, as well as in South America. The company mines at Butte were not worked at their combined maximum rate of production, as the market for copper was not sufficiently encouraging. As the mines under the control of the Anaconda Co. are connected and constantly kept in condition for mining, it is com-

paratively simple to stop or resume production in individual mines. The company's annual report says:

During the year 1925 there were done in the mines of the company, in the form of drifts, crosscuts, laterals, raises, winzes, and shafts, 34.19 miles of development work, as compared with 25.14 miles during the year 1924, an increase of 36 per cent.

The rebuilding of the zinc concentrator, after the fire of November 15, 1924, was finished and the plant put into operation January 19, 1925.

As a by-product of copper smelting operations, 8,817,109 pounds of arsenic was produced, of which 8,789,626 pounds was refined. * * *

Construction of an extension to the copper refinery at Great Falls was authorized at an estimated cost of $1,180,000. This extension will increase the annual capacity of the refineries from 216,000,000 to about 300,000,000 pounds per annum. An anode scrap melting furnace is also included in the proposed extension. The provision of these facilities will enable the company to refine in Montana all copper produced there and deliver it to western and middle west points, thereby saving freight to the Atlantic seaboard. Work on this extension is proceeding satisfactorily, and it is expected that it will be completed about the middle of the current year.

At the zinc plant the mechanical acid leaching and purification residue leaching steps, begun in 1924, were completed during the year. On July 25 authorization was given for the construction of a two-unit extension to the zinc plant at a cost of $1,250,000. This extension will increase the capacity of the plant from 180,000,000 to 240,000,000 pounds per annum. Work was begun at once and pushed as rapidly as possible, with the result that both units were put into commission soon after the close of the year.

During the month of August an extension of the rod mill was authorized at an estimated cost of $382,000. Work on this extension was partially completed at the end of the year.

The Anselmo Mining Co. operated its property the entire year and shipped a large quantity of both copper ore and zinc ore to Anaconda for milling and smelting. The ore contains very little lead, but the mine was a large producer of zinc, copper, and silver. The ore minerals are chalcocite, bornite, enargite, chalcopyrite, and sphalerite. The mine has a shaft 2,800 feet deep, and more than 5,000 feet of development work was done in 1925, chiefly in drifts and crosscuts.

The Anaconda Copper Mining Co. continued to work the Emma mine, belonging to the Butte Copper & Zinc Co. Manganese ore was shipped to eastern plants, but most of the output was lead-zinc ore, which was milled at Anaconda. Concentrate containing lead and zinc was treated in the electrolytic plant near Great Falls. The milling practice in the zinc mill at Anaconda was changed to a certain extent in 1925, and some of the ore from Butte, formerly reduced to a lead-zinc concentrate, was separated into a zinc product for Great Falls and a high-grade lead concentrate shipped to East Helena. From 104,781 tons of lead-zinc ore and 52,215 tons of manganese ore the Butte Copper & Zinc Co. received $454,398. The net income for the year was $378,949. After payment of dividends of $300,000, the surplus was $495,732. The following paragraphs are taken from the printed report of the Butte Copper & Zinc Co. for 1925:

The net returns to your company have been considerably larger than for the year 1924. * * *

The Marie Louise claim, adjoining the property of the Butte Copper & Zinc Co. on the east, was purchased.

The developments during the year have been satisfactory. On the 1,200-foot level and in the stopes above this level large bodies of ores high in zinc, silver, and lead have been developed, and shipments of ore from these bodies later on should show an improvement in the value of the concentrates produced.

Extensive new bodies of manganese ore, running as high as 41 per cent in manganese, are being opened up. One of the most important developments is in

the Czarromah claim, to the west of the Emma claim, where in virgin ground commercial bodies of zinc and manganese are being developed.

The Eveline mine of the Clark Montana Realty Co. was operated continuously, and more than 5,000 feet of development work, including station cutting, was done during the year. A little silver ore was shipped for smelting, but most of the output was lead-zinc ore milled at Anaconda.

The Butte & Superior Mining Co. was active nearly the entire year, shipping copper ore and lead-zinc ore to the mills at Anaconda. The property is worked through a shaft 3,000 feet deep, and more than 24,000 feet of development work was done in 1925. No milling is done at the mine, as all the machinery of the old concentrator has been sold. In 1925 the company paid dividends amounting to $580,395, or a total of $17,955,950 to date, and was the second largest producer of copper, silver, and lead, and the largest producer of zinc in Montana. As a result of ore sales, the company received $3,190,175. The cost of mining was $2,584,779, leaving an operating profit of $605,396, or a net income, without deduction for depletion, of $493,527. After paying the capital distributions the company had a surplus of $387,504 at the end of the year. The following paragraphs were taken from the company's printed report for 1925:

Development work for the year consisted of 18,003 feet of crosscuts and drifts, 5,739 feet of raises, and 275 feet of station development, or a total of 24,017 feet.

Zinc ore development throughout the year was somewhat more satisfactory than in the year 1924. In the early period of the year steps were taken toward opening up and reclaiming some remnants of ore in the old abandoned upper workings of the mine, these having been left behind as noncommercial in the early days of the property's operation.

The improvements in more recent years of metallurgical practice, as well as in other operating methods and in costs, have been such as to permit the profitable reclamation of these ores. In the second quarter a small tonnage from this class of ore bodies was recovered, and a continuation of salvaging throughout the third quarter proved so encouraging that in the fourth quarter a thorough study and review of old workings records was made with a view to forecasting the prospects of additional ore from this source. This indicated a possibility of recovering some 226,000 tons with an assay of 14.95 per cent of zinc and 8.08 ounces of silver. Subsequently plans were formulated for more intensive development on these ore bodies, which was begun and will be carried on during the coming year as required. With the exception of a little over 15,000 tons of ore developed in the last quarter of the year, none of this salvage ore was taken into ore reserves, but this will be done as it is developed in the course of our regular operations.

During the year a moderate tonnage of zinc ore was developed on the 2,200, 2,300, 2,500, 2,600, and 2,800 levels, but no zinc ore had been disclosed on the 3,000 level at the end of the year. The increase in the commercial ore reserves from the beginning to the end of the year amounted to 61,543 tons, but the zinc content decreased to 12.62 per cent, as compared with 14.6 per cent for the previous year.

Copper development throughout the year was less satisfactory than that of zinc ore, and the copper ore reserves were diminished 84,529 tons during the year. This decrease includes 19,045 tons abandoned as being too low grade to mine, contrary to previous estimates.

The estimated ore reserves at the end of 1925 follow: Zinc ore of commercial grade, 389,509 tons, averaging 12.62 per cent of zinc and 4.25 ounces of silver; zinc ore of noncommercial grade, 118,225 tons, averaging 7.36 per cent of zinc and 1.86 ounces of silver; copper ore, 219,501 tons, averaging 4.19 per cent of copper and 6.62 ounces of silver.

The total zinc ore produced during the year amounted to 265,610 dry tons, containing a total of 1,217 ounces of gold, 1,190,254 ounces of silver, 1,497,910 pounds of copper, 7,596,848 pounds of lead, and 53,819,561 pounds of zinc, or an average assay of 0.004 ounce of gold, 4.48 ounces of silver, 0.28 per cent of

copper, 1.43 per cent of lead, and 10.13 per cent of zinc. [The zinc ore and the copper ore were milled at Anaconda, but the contents of the concentrates are not published.—C. N. G.]

The production of copper ore amounted to 161,315 dry tons, containing a total of 633 ounces of gold, 925,350 ounces of silver, 12,152,967 pounds of copper, 779,213 pounds of lead, and 7,945,018 pounds of zinc, or an average assay of 0.004 ounce of gold, 5.74 ounces of silver, 3.77 per cent of copper, 0.24 per cent of lead, and 2.46 per cent of zinc. The grade of copper ore produced showed a decrease during the year as compared with the previous one, but the grade of copper ore in reserve increased.

At the end of the year there was being mined about 24,000 tons of zinc ore per month and about 12,000 tons of copper ore per month, which production it is believed should be maintained for most of the coming year except the summer months, when there is usually a shortage of working forces.

The entire production of both zinc and copper ore was sold to the Anaconda Copper Mining Co. during the year.

Dismantling of the mill and accessory buildings, which was started in the year 1924, was completed in the latter part of 1925.

The 500-ton copper smelter and 800-ton concentration-flotation plant of the East Butte Copper Mining Co. were idle in 1925, but the mine was active the entire year, shipping first-class copper ore for smelting and second-class copper ore for milling at Anaconda. The mine is opened by three vertical shafts, the deepest 2,440 feet, and nearly 30 miles of crosscuts and drifts. During 1925 development work consisted of 2,260 feet of raises and 4,358 feet of crosscuts and drifts, as well as considerable station cutting. From the Pittsmont property the company mined 66,367 dry tons of ore, averaging 4.88 per cent of copper and 2.9 ounces of silver to the ton. The metal content was reported as 418 ounces of gold, 192,625 ounces of silver, and 6,481,165 pounds of copper, but no statement is published giving the results after milling and smelting the ore at Anaconda. The net value received for the Pittsmont ore after paying freight and smelting charges was $521,128, but the operating cost was $560,334. The company, which also operated property in Colorado and Nevada, gave the following paragraphs regarding the Pittsmont mine at Butte in its annual printed report for 1925:

Following the discontinuation of mining and smelting operations at Butte in August, 1924, a carefully planned development program was carried on for the balance of the year and throughout 1925. Some mining was done in the early part of 1925, but a tonnage approaching normal production was not reached until the month of May.

Early in the year it was decided to open the 2,400 level ahead of the 2,200 level, and development was started on the 2,400 level in July. The work accomplished to date has consisted of cutting a station, crosscutting, and some drifting. The station is of sufficient size to meet all requirements, and a pumping plant of ample capacity has been installed. 'From the showings encountered on the 2,400 level to date it may be said that the outlook is more promising than it was on the 1,800 and 1,500 levels.

A feature of special interest was the launching of a leasing system which has been successfully carried on and which has made it possible to mine blocks of ore which could not have been mined at a profit at prevailing prices for copper. The leasing system has resulted in a marked increase in the grade of ore mined. As the returns to the men engaged in leasing depend upon the tonnage and grade of ore mined, it tends to promote careful mining and sorting, and also, since the leasers are charged with all tools and materials consumed, the trend toward economy is apparent.

The Pittsmont mine is in better condition than it was a year ago, and it is estimated that the tonnage of ore developed during the year more than offsets the tonnage removed.

The Elm Orlu Mining Co. operated its property at Butte nearly the entire year; it was a large producer of silver, copper, lead, and

zinc from copper ore milled at Anaconda and lead-zinc ore treated at the Timber Butte flotation plant, south of Butte. The mine is opened to a depth of 3,400 feet, and during 1925 about 23,000 feet of work was done in drifts, crosscuts, and raises. Compared with other mines in Montana, the Elm Orlu was second in the production of zinc and third in the production of silver and lead. No annual printed report giving details of operations is published.

The Timber Butte mill, south of Butte, is owned and operated by the Clark interests. For a number of years it treated old tailing and ore from the Clark properties, especially the Elm Orlu mine. The mill feed was formerly ore from the Elm Orlu, Moulton, and Poser mines, but in 1924 and 1925 the company developed a large custom business besides treating ore from the mines of the Clark interests. A description[6] of the plant, giving the flow sheet and methods of treating various types of ore from Butte, was published in October.

The Crystal Copper Co. worked the Goldsmith, Non-Consolidated, Amy, and St. Clair claims at Butte and produced several thousand tons of silver ore that was smelted at Anaconda and some lead-zinc ore that was shipped for milling. The property has a vertical shaft 850 feet deep, and 4,500 feet of development work was done in 1925.

The Butte West Side Mines Co. continued to operate the Minnie Jane mine and produced several thousand tons of first-class silver ore for smelting, as well as about 10,000 tons of lead-zinc ore which was shipped to the flotation mill at Butte. The shaft is 400 feet deep, and about 3,000 feet of work was done in crosscuts, drifts, raises, and winzes during 1925.

The Poser mine was worked the entire year and yielded nearly 77,000 tons of lead-zinc ore for milling. The metal production consisted mainly of 251,000 ounces of silver, 1,000,000 pounds of lead, and more than 10,000,000 pounds of zinc. Approximately 18,000 feet of development work was accomplished during the year. The Moulton mine, operated by the Moulton Mining Co., produced chiefly lead-zinc ore which was milled at the Timber Butte plant. Nearly 40,000 tons of ore was shipped for milling, and more than 4,000,000 pounds of zinc and 2,000,000 pounds of lead, as well as gold and silver, were recovered as a result of the treatment of cencentrates. Development for the year, other than station cutting, consisted of 5,555 feet of drifts, crosscuts, and raises.

The Midwest Butte Development Co. was a producer of considerable lead-zinc ore which was milled at Anaconda. This ore contained approximately 7 ounces of silver to the ton, 5 per cent of lead, and 8 to 20 per cent of zinc, with a little gold. The milling companies paid for 72 per cent of the gold, silver, and lead and 65 per cent of the zinc at the current New York metal prices, less various deductions. The mine is said to have much ore on the 800-foot level, and sinking will probably be continued to the 1,000-foot level.

The North Butte Mining Co., with property north of Butte, was not actively operated on company account, but lessees mined considerable copper ore that was shipped to Anaconda, either for smelting or milling. The property is opened by a vertical shaft 3,700

[6] Robie, Edward Hodges, "Selective flotation at Timber Butte": Eng. and Min. Jour.-Press, vol. 120, Oct. 31, 1925, p. 685.

feet deep, but no development work was done during the year. Leasing operations in the ground adjacent to the Speculator shaft, above the 1,000-foot level, produced 13,301 dry tons of ore, and the smelting company paid for 36.15 ounces of gold, 58,218 ounces of silver, and 1,601,985 pounds of copper. The income was $270,444 and expenses $265,864, leaving an operating profit of $4,580. Regarding the merger of the North Butte and Tuolumne properties, the printed report of the company for 1925 says:

> In the last report of the company your attention was called to the discovery of copper ore on the 2,000-foot level of the Main Range mine of the Tuolumne Copper Co. immediately adjoining the East Side holdings of your company. The president of your company examined this development in July, 1925, and satisfied himself that the discovery was of major importance as indicating very strongly the existence of similar ore in our East Side properties at the same horizon. The Sarsfield shaft and workings of your company never went deeper than 900 feet.
>
> The Main Range shaft of the Tuolumne Copper Co. is 2,200 feet deep. Your president proposed to the Tuolumne Copper Co. that the North Butte company be permitted to run a drift on the 2,200-foot level of the Tuolumne company out to the side line of the North Butte property at a distance of about 1,500 feet and from there start a new campaign of development of North Butte ground without having first to spend money and time, estimated at $500,000 and two years, in pumping out the Sarsfield shaft and sinking it 1,300 feet deeper to the 2,200-foot level.
>
> * * * After considerable study the officers of both companies came to the conclusion that a merger of the properties of the two companies was a much more advantageous arrangement and for the best interests of the stockholders of both. Accordingly, negotiations were conducted, resulting in a contract dated November 18, 1925, which was duly approved and ratified by the North Butte Mining Co. stockholders on December 29, 1925, and the Tuolumne Copper Co. stockholders on February 24, 1926. * * *
>
> Through the consummation of the merger and new financing, your company will be in position rapidly to open up the ore bodies disclosed in the East Side properties and to speed up the attack on the larger veins toward which the Tuolumne Copper Co. has been slowly moving. The consolidation of the two companies, together with certain additional claims when acquired, will give your company a length of over 6,000 feet along the strike of the main ore channel, with an equal length along the line of the so-called Northeast vein system. * * *

The Tuolumne Copper Co. shipped several hundred tons of copper ore from the Main Range mine, which was operated through lessees, and continued to develop its ore bodies. Early in 1926 the property was consolidated with that of the North Butte Mining Co. No printed annual report was issued, but development work was continued on the 1,200 and 2,200 foot levels, and a car of ore was said to have been shipped from the 2,000-foot level, east of the Continental fault.

Other mines that produced several hundred tons of ore in the vicinity of Butte were the Garfield-Salvador, Lizzie, Minnie Irvine, and Mountain Chief properties. Other small producers were the Black Hawk, Bullwhacker, Cripple, Butte-Los Angeles, Geneva, Humboldt, Little St. Lawrence, Narrow Gauge, Brittania, Elba, Venus, Veronica, Julia, General Sheridan, Glengarry, and Quartz Hill claims.

TOOLE COUNTY

Gold Butte district.—A little placer gold was shipped from the Banner claim on Eclipse Gulch.

GOLD, SILVER, COPPER, LEAD, AND ZINC IN NEVADA

(MINE REPORT)

By V. C. Heikes

PRODUCTION

An improvement in mining caused an increase in the mine production of copper, lead, and zinc, but not of gold and silver, in Nevada in 1925. The combined value of these five metals was $509,553 more than in 1924, although the decrease in gold and silver was $2,018,459. Six mining companies published or reported to the Bureau of Mines dividends that amounted to $1,646,765 paid in 1925.

Mine production of gold, silver, copper, lead, and zinc in Nevada in 1925

	Producers	Ore, old tailings, etc.	Gold [1]	Silver [1]	Copper	Lead	Zinc	Total value
		Short tons		*Fine oz.*	*Pounds*	*Pounds*	*Pounds*	
1925	424	[2] 4,927,139	$3,867,798	7,096,618	[3] 79,300,224	24,476,452	14,821,293	$23,309,352
Increase or decrease from 1924	+40	+227,806	−637,888	−2,314,761	+5,494,901	+4,416,411	+3,818,383	+509,553
Total, 1904–1925		76,142,750	195,473,041	223,675,588	1,217,480,661	300,809,651	215,093,923	605,926,670

[1] Includes placer production.
[2] Includes 8,290 tons of old tailings milled, 3,994 tons of slag sold to a smelter, 8 tons of sweeps sold to a smelter, 42 tons of sweeps cyanided, and 14 tons of matte sold to a smelter.
[3] Includes 476,540 pounds of copper saved from precipitates recovered from mine water largely from leaching of ore in place.

ORE

The quantity of ore, old tailings, slag, matte, etc., sold or treated in Nevada in 1925 increased 5 per cent over 1924. The quantity of copper ore mined was greatest; dry gold and silver ore followed. The total values of metals recovered from the ores, old tailings, etc., were as follows: Dry gold ore, $1,287,121; dry gold and silver ore, $1,894,577; dry silver ore, $3,477,690; copper ore, $12,010,156; lead ore, $2,540,696; zinc ore, $107,487; copper-lead ore, $7,801; lead-zinc ore, $1,930,497. The placer output, valued at $53,327, makes the total for the State $23,309,352.

Ore and metals produced in Nevada in 1925

Source	Producers	Ore, old tailings, etc.		Gold		Silver	
		Short tons	Per cent	Fine ounces	Per cent	Fine ounces	Per cent
Dry gold ore	156	[1] 129,914	2.64	59,519.79	31.81	77,247	1.09
Dry gold and silver ore	17	[2] 424,077	8.61	46,224.28	24.70	1,352,855	19.06
Dry silver ore	69	[3] 290,957	5.90	35,134.18	18.78	3,831,300	53.99
Copper ore	16	3,923,158	79.62	35,515.84	18.98	125,477	1.77
Lead ore	148	[4] 94,769	1.92	6,882.73	3.68	1,361,753	19.19
Zinc ore	6	2,274	.05	21.06	.01	8,104	.11
Copper-lead ore	4	[5] 125		4.87		3,259	.05
Lead-zinc ore	14	61,865	1.26	1,265.43	.68	335,338	4.72
Total lode mines		4,927,139	100.00	184,568.18	98.64	7,095,333	99.98
Total placers	25			2,536.54	1.36	1,285	.02
		4,927,139	100.00	187,104.72	100.00	7,096,618	100.00

Source	Copper		Lead		Zinc	
	Pounds	Per cent	Pounds	Per cent	Pounds	Per cent
Dry gold ore	5,325	0.01	27,272	0.11		
Dry gold and silver ore	1,082		19			
Dry silver ore	45,431	.06	988,843	4.04		
Copper ore	[6] 78,795,059	99.36				
Lead ore	351,494	.44	16,131,583	65.91		
Zinc ore	6,720	.01	76,243	.31	1,234,754	8.33
Copper-lead ore	11,426	.01	43,851	.18		
Lead-zinc ore	83,687	.11	7,208,641	29.45	13,586,539	91.67
	79,300,224	100.00	24,476,452	100.00	14,821,293	100.00

[1] Includes 2,270 tons of old tailings cyanided and 500 tons of old tailings amalgamated.
[2] Includes 2,350 tons of old tailings concentrated and 150 tons of old tailings cyanided.
[3] Includes 380 tons of old tailings concentrated, 470 tons of old tailings cyanided, 42 tons of sweeps cyanided, and 8 tons of sweeps sold to a smelter.
[4] Includes 2,170 tons of old tailings concentrated and 3,994 tons of slag sold to a smelter.
[5] Includes 14 tons of matte sold to a smelter.
[6] Includes 476,540 pounds of copper saved from precipitates recovered from mine water largely from leaching of ore in place.

GOLD ORE

The gold ore and old tailings, largely dry and siliceous, were reported by 156 producers in 1925, compared with 152 producers in 1924. The ore and old tailings yielded on the average $9.47 in gold and 0.59 ounce of silver to the ton, 0.01 per cent of lead, and a little copper, and had an average value of $9.91 in metals a ton. Nye County had the largest number of gold-ore producers—28—who reported 9,840 tons, mainly from the Round Mountain and Manhattan districts. Elko County, with only 11 producers of gold ore, had the greatest output—56,063 tons—nearly all of which came from the Jarbidge district. The largest producers of gold ore were the Elkoro and Bluster mines at Jarbidge, the Round Mountain Mining Co. at Round Mountain, the Duplex mine at Searchlight, and the Flowery mine at Virginia City. Gold ore from the new camp at Gilbert, Esmeralda County, was hauled to the custom cyanidation mill at Millers.

Dry gold ore and old tailings sold or treated in Nevada in 1925, with content in terms of recovered metals

County	Ore and old tailings	Gold	Silver	Copper	Lead
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*
Churchill	1	19.03	11		
Clark	2,674	1,295.57	705	974	27,101
Douglas	12	18.91	9		
Elko	56,063	26,648.04	33,987	10	10
Esmeralda	[1] 4,841	7,701.57	6,470	4,156	
Eureka	41	91.03	30		
Humboldt	192	313.80	494		
Lander	645	434.06	735	71	
Lyon	[2] 2,246	690.19	4,235		
Mineral	419	914.63	878	20	38
Nye	9,840	6,264.98	3,695		123
Ormsby	[3] 500	90.30	221		
Pershing	510	999.33	1,204	46	
Storey	[4] 51,299	12,567.69	23,809	38	
Washoe	624	1,446.99	727		
White Pine	7	23.67	37	10	
	129,914	59,519.79	77,247	5,325	27,272

[1] Includes 170 tons of old tailings cyanided.
[2] Includes 1,952 tons of old tailings cyanided.
[3] Consists of old tailings amalgamated.
[4] Includes 148 tons of old tailings cyanided.

GOLD AND SILVER ORE

Gold and silver ore and old tailings were reported from 7 counties by 17 producers. The ore and old tailings yielded on the average $2.25 in gold and 3.19 ounces of silver to the ton. Five producers in Storey County reported the treatment of 423,026 tons of ore and old tailings, all from the Comstock district. The Comstock Merger Mines (Inc.), at Gold Hill, treated nearly all the gold and silver ore and as a result was the largest producer of gold in the State.

Dry gold and silver ore and old tailings sold or treated in Nevada in 1925, with content in terms of recovered metals

County	Ore and old tailings	Gold	Silver	Copper	Lead
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*
Elko	75	16.00	600		
Esmeralda	136	108.80	4,760		
Humboldt	140	106.68	3,959		
Mineral	209	188.32	7,231		
Nye	490	468.99	9,915	282	
Pershing	1	.90	43		19
Storey	[1] 423,026	45,334.59	1,326,347	800	
	424,077	46,224.28	1,352,855	1,082	19

[1] Includes 2,350 tons of old tailings concentrated and 150 tons of old tailings cyanided.

SILVER ORE

The output of siliceous silver ore, old tailings, and sweeps in 1925 was reported by 69 producers. The average yield of this material was $2.50 in gold and 13.17 ounces of silver to the ton, 0.01 per cent of copper, and 0.17 per cent of lead. The Tonopah district, in Nye

and Esmeralda Counties, was the largest producer of silver ore and was credited with 197,409 tons, produced from 13 properties. There was, however, a marked decrease in the output of silver ore, especially from Nye County, and consequently a large decrease in the quantity of gold and silver recovered therefrom.

Dry silver ore, old tailings, etc., sold or treated in Nevada in 1925, with content in terms of recovered metals

County	Ore, old tailings, etc.	Gold	Silver	Copper	Lead
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*
Churchill	13	4.68	907		735
Clark	20	7.16	2,914	86	1,858
Elko	11	5.87	1,205	10	218
Esmeralda	6,535	717.54	106,563	741	1,308
Humboldt	123	2.05	4,640	36	
Lander	40,304	669.44	365,024	2,227	31,757
Lincoln	18,466	81.86	53,265	39,958	946,589
Lyon	[1] 380	21.39	1,632	285	
Mineral	23,238	251.84	191,167	895	1,703
Nye	192,963	32,646.59	3,031,160	640	3,945
Ormsby	16	.80	429	500	300
Pershing	[2] 8,398	715.44	62,106		100
Washoe	2	1.82	329		
White Pine	[3] 488	7.70	9,959	53	330
	290,957	35,134.18	3,831,300	45,431	988,843

[1] Consists of old tailings concentrated.
[2] Includes 42 tons of sweeps cyanided and 8 tons of sweeps sold to a smelter.
[3] Includes 470 tons of old tailings cyanided.

COPPER ORE

In 1925 there were 16 producers of copper ore in Nevada. The ore yielded on the average 19 cents in gold and 0.03 ounce of silver to the ton and 1 per cent of copper; its average value was $3.04 in metals a ton. The Nevada Consolidated Copper Co., in the Robinson district, White Pine County, was the chief producer. A decidedly increased output was recorded.

Copper ore sold or treated in Nevada in 1925, with content in terms of recovered metals

County	Ore	Gold	Silver	Copper
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*
Elko	408	49.55	1,504	78,177
Lander	479	46.69	7,132	42,656
Lyon	498	1.50	10	42,850
Nye	12	5.00	720	1,500
Ormsby	3	.04	48	250
Washoe	24	3.00	81	2,858
White Pine	3,921,734	35,410.06	115,982	[1] 78,626,768
	3,923,158	35,515.84	125,477	78,795,059

[1] Includes 476,540 pounds of copper saved from precipitates recovered from mine water largely from leaching of ore in place.

LEAD ORE AND COPPER-LEAD ORE

In 1925 lead ore, old tailings, and slag were produced in Nevada at 148 mines and prospects, compared with 94 in 1924. The average yield of the ore, old tailings, etc., was $1.51 in gold and 14.37 ounces of silver to the ton, 0.19 per cent of copper, and 8.51 per cent of lead; the average value was $26.81 in metals a ton.

The output of copper-lead ore and matte was reported by four producers. This material yielded on the average 81 cents in gold and 26.07 ounces of silver to the ton, 4.57 per cent of copper, and 17.54 per cent of lead; its average value was $62.41 in metals a ton.

Lead ore, old tailings, etc., sold or treated in Nevada in 1925, with content in terms of recovered metals

County	Ore, old tailings, etc.	Gold	Silver	Copper	Lead
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*
Churchill	1,431	99.75	66,286	1,914	918,891
Clark	[1] 6,872	2,553.94	52,415	15,230	3,210,397
Elko	[2] 10,699	27.87	107,550	98,690	3,103,618
Esmeralda	474	54.40	6,796	2,263	226,978
Eureka	[3] 31,009	1,536.75	101,808	25,955	4,331,011
Humboldt	17	.70	851		2,560
Lander	23,606	82.86	602,935	35,136	302,545
Lincoln	5,074	208.95	62,761	111,197	902,992
Mineral	1,041	1,438.09	96,556	9,344	258,622
Nye	1,890	710.53	51,787	4,202	694,897
Pershing	344	28.10	8,616	1,935	99,858
Washoe	7,887	17.42	176,445	31,172	524,221
White Pine	4,425	123.37	26,947	14,456	1,554,993
	94,769	6,882.73	1,361,753	351,494	16,131,583

[1] Includes 2,170 tons of old tailings concentrated.
[2] Includes 3,941 tons of slag sold to a smelter.
[3] Includes 53 tons of slag sold to a smelter.

ZINC ORE AND LEAD-ZINC ORE

The output of zinc ore was reported by six producers—in the Yellow Pine district in Clark County, the Ruby Range district in Elko County, the Pioche district in Lincoln County, and the Aurum and Robinson districts in White Pine County. The ore yielded on the average 19 cents in gold and 3.56 ounces of silver to the ton, 0.15 per cent of copper, 1.68 per cent of lead, and 27.15 per cent of zinc, and was valued at $47.27 in metals a ton. Most of the zinc ore came from the Potosi mine in Clark County.

Lead-zinc ore was produced from 14 mines—in the Yellow Pine district in Clark County, the Lida district in Esmeralda County, Pioche and Viola districts in Lincoln County, the Bell district in Mineral County, the Leadville district in Washoe County, and the Robinson district in White Pine County. The ore yielded on the average 42 cents in gold and 5.42 ounces of silver to the ton, 0.07 per cent of copper, 5.83 per cent of lead, and 10.98 per cent of zinc, and was valued at $31.20 in metals a ton. Most of the lead-zinc ore came from the Combined Metals mine in Lincoln County and from the Rover mine (Yellow Pine Mining Co.) in Clark County.

Zinc ore sold or treated in Nevada in 1925, with content in terms of recovered metals

County	Ore	Gold	Silver	Copper	Lead	Zinc
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*
Clark	1,506	10.80	6,210	6,320	38,700	930,480
Elko	38					23,781
Lincoln	467	10.26	1,808		37,393	104,088
White Pine	263		86	400	150	176,405
	2,274	21.06	8,104	6,720	76,243	1,234,754

Lead-zinc ore sold or treated in Nevada in 1925, with content in terms of recovered metals

County	Ore	Gold	Silver	Copper	Lead	Zinc
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*
Clark	12,964		16,174		2,131,384	5,300,184
Esmeralda	28	.60	91	94	8,506	5,783
Lincoln	39,486	1,137.12	285,575	77,378	4,530,287	7,945,907
Mineral	9,000	109.59	18,015	3,023	479,644	255,000
Washoe	104	3.48	11,149	2,265	24,966	30,286
White Pine	283	14.64	4,334	927	33,854	49,379
	61,865	1,265.43	335,338	83,687	7,208,641	13,586,539

The following table shows the zinc ore, lead-zinc ore, and concentrates produced in 1925, also the average zinc content (assay) and the recovered zinc.

Zinc ore, lead-zinc ore, and concentrates (as marketed from Nevada mines and mills) sold to smelters in 1925

Classification	County	Quantity (dry weight)	Gross zinc	Average assay of ore or concentrates	Recovered zinc
		Short tons	*Pounds*	*Per cent*	*Pounds*
Oxidized zinc ore	Clark, Elko, and White Pine	320	251,547	39.30	212,656
Sulphide zinc ore	Clark and Lincoln	503	170,734	16.97	129,648
Oxidized lead-zinc ore	do	8,232	4,925,686	29.92	3,947,479
Zinc and lead-zinc concentrates	Clark, Esmeralda, Lincoln, Mineral, Washoe, and White Pine	14,552	12,323,995	42.34	10,531,510
		23,607	17,671,962	37.43	14,821,293

MINING AND METALLURGIC INDUSTRY

Because of the general increase in metal prices a revival of mining in many of the mining camps of Nevada was evident during 1925, despite the fact that there was a serious decrease in the output of both gold and silver from the Tonopah district. The discovery of gold at Gilbert in northeastern Esmeralda County, the opening of shipping ore containing lead and silver at Quartz Mountain in the Mammoth district of Nye County, and the development of rich silver-lead ore at the Chalk Mountain property in Churchill County, 5 miles north of Fairview, created much interest. Gold was also discovered at the new camp of Westville, a few miles south of Wonder, and at Gold Basin in Churchill County, east of Fairview. Gold-silver ore was being developed at the Dan Tucker mine, 10 miles

west of Fairview, which has promise of becoming a producer. In May notice was served on producers of siliceous ore that no more of the material would be purchased for the Mammoth smelter at Kennett, Calif. The smelter was closed in August, and many small properties and leases were compelled to stop work. Siliceous ore, however, will again be required when the Mason Valley smelter at Thompson starts operation.

Milling practice in Nevada, as in other States, has been greatly improved, and the flotation process is being used in the majority of mills that treat sulphide ores. The Nevada Consolidated mill in White Pine County affords unmistakable evidence of the advance that has gradually been made in the treatment of porphyry copper ores by flotation, combined with improved mill design and simplified flow sheet.

The general conditions for the production of copper, lead, and zinc were decidedly improved, as shown in the output of metals recovered from White Pine, Lincoln, Elko, and Eureka Counties. Although the total output of silver was much less, certain camps in Mineral, Churchill, and Eureka Counties showed a fair increase.

Sixty-five milling plants treated Nevada ore in 1925. Of these, 26 used the amalgamation process, 17 concentration (7 used flotation, 3 tables and flotation, and 7 tables only), 13 cyanidation, 2 concentration and cyanidation, 1 amalgamation and cyanidation, 4 amalgamation and concentration (1 of these used flotation), and 2 were leaching plants where copper was recovered by precipitation largely from ore in place.

A revised list of milling plants in Nevada for 1925, giving details of equipment, has been prepared by the Bureau of Mines as a separate pamphlet, which may be had on request.

About 600 pounds of mercury were purchased for amalgamation plants, and 2,123,687 pounds of sodium cyanide were used in other mills.

Gold and silver produced at Nevada mills in 1925

County	Ore (short tons)	Bullion (fine ounces) recovered by—				Total value
		Amalgamation		Cyanidation		
		Gold	Silver	Gold	Silver	
Clark	[1] 2,674	1,152.09	393			$24,089
Douglas	12	18.91	9			397
Elko	56,128	48.93	641	26,522.11	33,171	572,738
Esmeralda	[2] 9,188	645.24	411	[3] 4,623.12	[3] 105,232	182,223
Eureka	6			3.83	9	85
Humboldt	182	207.02	65	7.11	192	4,604
Lander	[4] 40,587	102.08	56	716.39	311,521	233,155
Lyon	287	397.34	299	[5] 268.27	[5] 3,684	16,523
Mineral	23,584	479.97	429	312.14	189,511	148,192
Nye	202,617	5,950.06	3,399	33,219.90	3,028,692	2,913,986
Ormsby	(6)	[6] 90.30	[6] 221			2,020
Pershing	8,759	888.02	526	[7] 802.12	[7] 60,329	77,172
Storey	[8] 469,206	774.11	651	[9] 55,728.40	[9] 1,331,647	2,092,625
Washoe	618	1,435.71	641			30,124
White Pine	2	1.43	1	[10] 1.70	[10] 9,437	6,615
	813,850	12,191.21	7,742	122,205.09	5,073,425	6,304,548

[1] Also yielded 45 tons of lead concentrate.
[2] Also yielded 1 ton of siliceous concentrate.
[3] Includes bullion from 170 tons of old tailings.
[4] Also yielded 342 tons of lead concentrate.
[5] Includes bullion from 1,952 tons of old tailings.
[6] Bullion is from 500 tons of old tailings.
[7] Includes bullion from 42 tons of sweeps.
[8] Also yielded 3 tons of siliceous concentrate.
[9] Includes bullion from 298 tons of old tailings.
[10] Includes bullion from 470 tons of old tailings.

The output of milling ore, old tailings, and sweeps was 4,783,820 tons, of which 813,850 tons of ore and 3,432 tons of old tailings and sweeps were treated by amalgamation or cyanidation and 3,961,638 tons of ore and 4,900 tons of old tailings by concentration followed by smelting. The ore, old tailings, and sweeps treated by cyanidation (801,141 tons) yielded on the average $3.15 in gold and 6.33 ounces of silver to the ton. The ore and old tailings amalgamated (16,141 tons) yielded bullion averaging $15.61 in gold and 0.48 ounce of silver to the ton. Of the total ore, tailings, etc., 80.5 per cent was of concentrating grade and produced concentrate yielding on the average $31.94 in metals a ton.

Mine production of metals from Nevada concentrates in 1925

BY COUNTIES

	Ore to concentrating mills	Concentrates	Gold	Silver	Copper	Lead	Zinc	Total value of metal
	Short tons	*Short tons*	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*	
Clark	[1] 7,070	[2] 4,906	637.78	31,570	8,482	1,643,617	2,256,406	$350,780
Elko	1,769	242	1.35	8,666	428	240,024		26,985
Esmeralda	172	65	13.92	1,571	981	39,102	5,783	5,358
Eureka	25,908	2,864	241.01	44,118	2,830	2,563,830		259,055
Humboldt	130	24	99.57	3,767				4,672
Lander	23,290	1,562	72.63	610,809	33,626	215,132		448,893
Lincoln	41,234	20,818	1,245.34	288,255	77,878	4,541,307	7,934,656	1,234,980
Lyon	[3]	[4] 19	21.39	1,632	285			1,615
Mineral	9,000	680	109.59	18,015	3,023	479,644	255,000	76,306
Nye	35	8	.33	522		5,765		870
Storey	[5]	[6] 50	207.11	3,855	800			7,070
Washoe	7,978	930	20.48	186,661	33,327	542,840	30,286	184,227
White Pine	3,845,052	397,572	34,787.73	117,858	72,612,758	83,467	49,379	11,122,947
	3,961,638	429,740	37,458.23	1,317,299	72,774,418	10,354,728	10,531,510	13,723,758

BY KINDS OF CONCENTRATES

Dry and siliceous	335	346.04	11,856	11,800			$17,056
Copper	397,434	34,770.99	112,524	72,611,578			11,107,716
Lead	17,419	1,927.71	1,084,764	94,676	9,107,258		1,598,450
Zinc	11,732	413.49	108,155	56,364	924,680	9,167,554	868,792
Lead-zinc	2,820				322,790	1,363,956	131,744

AVERAGE RECOVERABLE CONTENT

	Short tons	*Fine ounces per ton*	*Fine ounces per ton*	*Per cent*	*Per cent*	*Per cent*	*Value per ton*
Dry and siliceous	335	1.033	35.39	1.76			$50.91
Copper	397,434	.087	.28	9.14			27.95
Lead	17,419	.111	62.27	.27	26.14		91.76
Zinc	11,732	.035	9.22	.24	3.94	39.07	74.05
Lead-zinc	2,820				5.72	24.18	46.72
	429,740	.087	3.07	8.47	1.20	1.23	31.94

[1] Also 2,170 tons of old tailings concentrated.
[2] Includes concentrates from 2,170 tons of old tailings.
[3] 380 tons of old tailings concentrated.
[4] Concentrates from 380 tons of old tailings.
[5] 2,350 tons of old tailings concentrated.
[6] Includes concentrates from 2,350 tons of old tailings.

The ore of smelting grade represented 2.8 per cent of the total quantity of ore, tailings, etc., mined or treated and consisted principally of first-class copper ore, lead ore, and dry and siliceous ore.

The quantity of copper ore smelted decreased in 1925; more than half of it was sulphide. The lead ore of smelting grade, largely carbonate, increased to 26,812 tons. The quantity of lead-zinc ore smelted decreased 30 per cent.

Mine production of metals from Nevada crude ore shipped to smelters in 1925

BY COUNTIES

	Ore	Gold	Silver	Copper	Lead	Zinc	Total value of metal
	Short tons	*Fine oz.*	*Fine oz.*	*Pounds*	*Pounds*	*Pounds*	
Churchill	1,445	123.46	67,204	1,914	919,626		$129,471
Clark	12,122	2,077.60	46,455	14,128	3,765,823	3,974,258	706,864
Elko	5,456	169.93	87,206	104,548	1,757,526	23,781	233,592
Esmeralda	2,484	3,300.63	17,466	6,273	197,690		98,441
Eureka	5,083	1,363.68	57,392	22,406	1,762,652		224,553
Humboldt	160	109.53	5,920	36	2,560		6,601
Lander	1,157	341.95	53,440	46,464	119,170		61,122
Lincoln	22,264	192.90	115,493	151,156	1,877,217	115,339	277,688
Lyon	505	26.08	262	42,850			6,806
Mineral	1,323	2,000.77	105,892	10,259	260,363		138,957
Nye	2,543	925.80	64,664	6,624	693,200		125,264
Ormsby	19	.84	477	750	300		480
Pershing	444	53.33	10,777	1,981	99,977		17,560
Storey	2,471	1,192.66	14,003	38			34,377
Washoe	45	16.52	1,429	2,968	6,347		2,306
White Pine	81,782	789.88	32,593	5,563,345	1,546,160	176,405	976,866
	139,303	12,685.56	680,673	5,975,740	13,008,611	4,289,783	3,040,948

BY KINDS OF ORE

Dry and siliceous	24,798	5,963.15	130,674	47,937	957,530		$304,069
Copper	78,527	744.85	12,953	5,706,941			834,773
Lead	26,812	5,965.95	532,269	209,932	10,791,882		1,461,426
Zinc	823	10.26	1,894	400	37,543	342,304	30,864
Copper-lead	111	1.35	2,883	10,530	41,563		7,140
Lead-zinc	8,232				1,180,093	3,947,479	402,676

AVERAGE RECOVERABLE CONTENT

		Fine oz. per ton	*Fine oz. per ton*	*Per cent*	*Per cent*	*Per cent*	*Value per ton*
Dry and siliceous	24,798	0.240	5.27	0.10	1.93		$12.26
Copper:							
Oxidized	36,355	.113	.11	2.22			6.64
Sulphide	42,172	.008	.21	4.85			14.07
Lead:							
Oxidized	22,683	.225	18.58	.43	18.52		51.00
Sulphide	4,129	.207	26.83	1.65	28.97		73.78
Zinc:							
Oxidized	320		.27	.06	.02	33.23	50.91
Sulphide	503	.020	3.59		7.43	12.89	28.97
Copper-lead: Oxidized	111	.012	25.97	4.74	18.72		64.32
Lead-zinc: Oxidized	8,232				7.17	23.98	48.92
	139,303	.091	4.89	2.14	4.67	1.54	21.83

GOLD

The value of the mine production of gold in Nevada decreased from $4,505,686 in 1924 to $3,867,798 in 1925. Ore was treated by amalgamation in 13 counties and gold amalgam by one plant re-treating tailings in Ormsby County. Cyanidation of ore, old tailings, and sweeps was reported in 11 counties. By these two methods of treatment $2,778,218 in gold was recovered from 813,850 tons of ore, 3,390 tons of old tailings, and 42 tons of sweeps. Most of the placer

gold in 1925 was obtained by hydraulic and drift mining in the Round Mountain and Manhattan districts, Nye County, and by rocker and hydraulic mining in the Battle Mountain district, Lander County.

Seven producers supplied nearly 78 per cent of the total gold in 1925. Their properties, yielding more than 6,000 ounces each, were the Comstock Merger in the Comstock district, the Nevada Consolidated at Ely, the Elkoro at Jarbidge, the Tonopah Extension at Tonopah, the Flowery at Virginia City, the Tonopah Belmont at Tonopah, and the Round Mountain Mining Co. at Round Mountain.

SILVER

In 1925 the mine production of silver decreased 25 per cent in quantity, due in large part to the marked decrease from the Tonopah district. The decrease in total value was only 22 per cent, as the average price of silver increased from 67 cents an ounce in 1924 to 69.4 cents in 1925. The largest decreases in quantity were in Nye, Pershing, Storey, and Washoe Counties. In Nye County 3,032,091 ounces of silver were contained in bullion recovered at amalgamation or cyanidation mills, most of which (3,028,692 ounces) was recovered by cyanidation, largely from ores treated in the eastern part of the Tonopah district in Nye County. In the Comstock district, Storey County, the output of silver was 1,350,156 ounces, most of which was recovered by cyanidation. Other districts that were important producers of silver in 1925 were the Lewis and Cortez districts, Lander County, and the Pioche district, Lincoln County. Concentrates yielded 1,317,299 ounces of silver, against 1,220,103 ounces in 1924. Lead concentrates yielded 1,084,764 ounces of silver, an average recovery of 62.27 ounces per ton, against 1,064,944 ounces, an average of 67.32 ounces, in 1924.

Five properties yielded more than 62 per cent of the total output of silver. These properties, in order of production, were the Tonopah Extension at Tonopah, the Comstock Merger in the Comstock district, the Tonopah Belmont at Tonopah, the Betty O'Neal near Battle Mountain, and Tonopah Mining at Tonopah. Other large silver producers were the West End, Consolidated Cortez, Combined Metals, Leadville, and New Candelaria mines.

COPPER

In 1925 the mine production of copper in Nevada increased 7 per cent in quantity but 16 per cent ($1,592,135) in value, owing to the increase in average price. The Nevada Consolidated Copper Co., at Ely, White Pine County, made the largest output, producing copper at an average of approximately 6,000,000 pounds a month. Shipments of first-class ore and mill ore were made until August from the property of the Consolidated Coppermines to the smelter of the Nevada Consolidated Co. at McGill. Experimental work was also done in leaching copper ore in place. The copper mines in Lyon County were virtually idle, but preparations were made by the Mason Valley Mines Co. for resuming milling and smelting operations.

LEAD

The mine production of lead in Nevada in 1925 increased 22 per cent in quantity. About 42 per cent of the lead was derived from concentrates of milling ore and tailings, and 53 per cent from crude ore shipped directly to smelters. Lead concentrates (carbonates and sulphides) shipped to smelters yielded 9,107,258 pounds of lead, an average of 26.14 per cent, against 6,818,212 pounds, or 21.55 per cent, in 1924. The total crude ore of shipping grade yielded 13,008,611 pounds of lead, against 11,834,231 pounds in 1924. Oxidized lead ore shipped to smelters yielded 8,399,758 pounds of lead and sulphide ore 2,392,124 pounds, against 6,843,149 pounds and 1,060,305 pounds, respectively, in 1924. First-class copper-lead ore (all of which was oxidized ore) yielded 41,563 pounds of lead. The lead-zinc ore of smelting grade (all of which was oxidized ore) yielded 1,180,093 pounds of lead, and zinc ore (mostly sulphide ore) 37,543 pounds.

More than 71 per cent of the lead came from 10 mines. The Combined Metals at Pioche, Lincoln County, was the largest producer, followed by the Yellow Pine Mining Co. in Clark County, the Eureka Holly in Eureka County, the Nevada Bunker Hill Mining Co. (slag dump) in Elko County, the Virginia Louise in Lincoln County, the Chalk Mountain in Churchill County, the Richmond-Eureka in Eureka County, Black Forest in Elko County, the Quartz Mountain in Nye County, and Leadville Mines Co. in Washoe County. The old slag from the dump of the Nevada Bunker Hill Mining Co. in Elko County yielded 1,106,296 pounds of lead.

ZINC

In 1925 the mine production of zinc in Nevada increased 35 per cent, due in large part to the active operations of the Combined Metals Reduction Co. in Lincoln County.

The Pioche district, Lincoln County, produced more than half of the total zinc output of the State and was followed by the Yellow Pine district in Clark County, which was for years the largest zinc-producing district of the State.

Sulphide zinc-lead ore from Pioche was treated by flotation in the plant of the Combined Metals Reduction Co. at Bauer, Utah. The resulting lead concentrate was shipped to International, Utah, and the zinc product to Great Falls, Mont., and Florence, Colo. The Yellow Pine Mining Co. at Goodsprings shipped carbonate ore and concentrate to eastern zinc plants. Other small zinc producers were the Potosi mine near Arden, the Simon mine in Mineral County, the Consolidated Coppermines near Ely, and the Anchor mine at Goodsprings.

REVIEW BY COUNTIES AND DISTRICTS

Mine production of gold, silver, copper, lead, and zinc in Nevada in 1925

County	Gold					Silver [1]	
	Placers		Lode mines		Total value	Fine ounces	Value
	Fine ounces	Value	Fine ounces	Value			
Churchill			123.45	$2,552	$2,552	67,204	$46,640
Clark			3,867.48	79,948	79,948	78,418	54,422
Douglas	1.60	$33	18.91	391	424	9	6
Elko			26,747.31	552,916	552,916	144,846	100,523
Esmeralda			8,582.93	177,425	177,425	124,680	86,528
Eureka	78.95	1,632	1,627.77	33,649	35,281	101,843	70,679
Humboldt	3.53	73	423.23	8,749	8,822	9,945	6,902
Lander	193.84	4,007	1,233.03	25,489	29,496	975,857	677,245
Lincoln			1,438.24	29,731	29,731	403,748	280,201
Lyon			713.10	14,741	14,741	5,877	4,079
Mineral			2,902.45	59,999	59,999	313,847	217,810
Nye	2,199.27	45,463	40,096.06	828,859	874,322	3,098,513	2,150,368
Ormsby			91.14	1,884	1,884	698	484
Pershing	41.84	865	1,743.78	36,047	36,912	71,978	49,953
Storey			57,902.26	1,196,946	1,196,946	1,350,156	937,008
Washoe			1,472.73	30,444	30,444	188,731	130,979
White Pine	17.51	362	35,584.31	735,593	735,955	160,268	111,226
Total, 1924	2,536.54	52,435	184,568.18	3,815,363	3,867,798	7,096,618	4,925,053
	1,323.97	27,369	216,638.59	4,478,317	4,505,686	9,411,379	6,305,624

County	Copper		Lead		Zinc		Total value
	Pounds	Value	Pounds	Value	Pounds	Value	
Churchill	1,914	$272	919,626	$80,007			$129,471
Clark	22,610	3,211	5,409,440	470,621	6,230,664	$473,530	1,081,732
Douglas							430
Elko	176,887	25,118	3,103,846	270,034	23,781	1,807	950,398
Esmeralda	7,254	1,030	236,792	20,601	5,783	439	286,023
Eureka	25,955	3,686	4,331,011	376,798			486,444
Humboldt	36	5	2,560	223			15,952
Lander	80,090	11,373	334,302	29,084			747,198
Lincoln	229,034	32,523	6,418,524	558,412	8,049,995	611,800	1,512,667
Lyon	43,135	6,125					24,945
Mineral	13,282	1,886	740,007	64,381	255,000	19,380	363,456
Nye	6,624	941	698,965	60,810			3,086,441
Ormsby	750	106	300	26			2,500
Pershing	1,981	281	99,977	8,698			95,844
Storey	838	119					2,134,073
Washoe	36,295	5,154	549,187	47,779	30,286	2,302	216,658
White Pine	78,653,539	11,168,802	1,631,915	141,977	225,784	17,160	12,175,120
Total, 1924	79,300,224	11,260,632	24,476,452	2,129,451	14,821,293	1,126,418	23,309,352
	73,805,323	9,668,497	20,060,041	1,604,803	11,002,910	715,189	22,799,799

[1] Includes placer production.

Ore, old tailings, etc., sold or treated, lode mines producing, and average value of ore, tailings, etc., in Nevada, 1924–25

County	Ore, old tailings, etc., sold or treated in 1925 (short tons)		Number of lode mines producing		Average total value per ton [1]		Average value per ton in gold and silver [1]	
	Total	Increase or decrease	1924	1925	1924	1925	1924	1925
Churchill	1,445	+1,344	10	9	$67.09	$89.60	$36.98	$34.04
Clark	24,036	+886	16	35	54.49	45.00	5.32	5.59
Douglas	12	−110	3	1	15.97	33.08	15.97	33.08
Elko	67,294	−3,058	23	43	11.43	14.12	9.62	9.71
Esmeralda	12,014	−7,768	41	38	18.36	23.81	17.80	21.97
Eureka	31,050	+11,024	11	15	11.36	15.61	3.21	3.36
Humboldt	472	−1,838	14	12	25.68	33.64	25.50	33.16
Lander	65,034	−1,658	15	18	10.63	11.43	9.84	10.81
Lincoln	63,498	−10,785	13	17	12.85	23.82	4.68	4.88
Lyon	3,124	+126	12	14	10.16	7.98	9.68	6.02
Mineral	33,907	+28,897	35	35	22.48	10.72	21.90	8.19
Nye	205,195	−97,699	54	57	15.94	14.82	15.92	14.51
Ormsby	519	+447	2	3	17.29	4.82	10.10	4.56
Pershing	9,253	−24,454	34	28	10.78	10.26	10.70	9.29
Storey	474,325	−73,103	24	23	4.00	4.50	4.00	4.50
Washoe	8,641	−5,535	15	19	20.87	25.07	15.14	18.68
White Pine	3,927,320	+411,090	26	32	[2] 2.99	3.08	.22	.22
	4,927,139	+227,806	348	399	[2] 4.84	4.71	2.29	1.77

[1] Placer product excluded.
[2] Figures revised to exclude value of copper recovered from precipitates.

Production of placer mines in Nevada, 1924–25

County	1924					1925				
	Mines		Gold	Silver (fine ounces)	Total value	Mines		Gold	Silver (fine ounces)	Total value
	Hydraulic and sluicing	Drift				Hydraulic and sluicing	Drift			
Douglas	2	------	$196	1	$197	1	------	$33	--------	$33
Esmeralda	1	------	307	9	313	------	------	------	--------	------
Eureka	------	------	------	------	------	2	------	1,632	5	1,635
Humboldt	2	------	645	2	646	1	------	73	1	74
Lander	6	------	4,029	27	4,047	7	------	4,007	31	4,029
Mineral	1	------	173	2	174	------	------	------	--------	------
Nye	[1] 15	------	19,083	461	19,392	8	2	45,463	1,236	46,321
Pershing	7	1	2,062	37	2,087	2	1	865	9	871
White Pine	1	------	874	7	879	1	------	362	3	364
	35	1	27,369	546	27,735	22	3	52,435	1,285	53,327

[1] Part of operations drifting.

CHURCHILL COUNTY

Broken Hills district.—Two producers shipped 39 tons of ore, which yielded gold, silver, and lead valued at $5,673. The Broken Hills mine produced one lot of lead ore containing 212 ounces of silver and 40 cents in gold to the ton, 12 per cent of lead, 7 per cent of sulphur, 4 per cent of iron, and 57 per cent of insoluble. This ore was hauled 74 miles to Fallon, on the Southern Pacific Railroad.

Fairview district.—Five producers in the Fairview district reported ore of shipping grade. Most of the output came from the property of the Chalk Mountain Silver-Lead Mines Co., and was produced largely during development work which has been going on for the past two years. In 1925 the mine was the largest producer in the district, having shipped 1,505 tons of ore, according to the company report. The ore contained 99 ounces of gold, 59,347 ounces of silver, and 861,355 pounds of lead, and netted the company $86,723. The mine is developed by a vertical shaft about 485 feet deep and has 1,400 feet of drifts. Chalk Mountain is 45 miles east and south of Fallon, the shipping point, and 5 miles north of Fairview. The Twin Metals Mines Syndicate was also a producer and shipper of small lots of ore sorted from various dumps.

Holy Cross district.—The Pyramid mine was worked by a lessee who shipped a small lot of silver ore.

CLARK COUNTY

In Clark County there were 35 producers, 19 more than in 1924, and the yield of ore and old tailings and of gold increased—ore and tailings from 23,150 to 24,036 tons and gold from $38,007 to $79,948. The output of silver decreased from 127,182 to 78,418 fine ounces, copper from 23,257 to 22,610 pounds, lead from 7,764,771 to 5,409,440 pounds, zinc from 7,909,042 to 6,230,664 pounds, and the total value of the metals from $1,261,536 to $1,081,732.

Bunkerville district.—Fifty-seven tons of sulphide lead ore containing silver were shipped from the dump of one of the old mines.

Eldorado Canyon district.—Five mine operators reported the output of 708 tons of ore, which yielded $11,145 in gold, 3,621 ounces of silver, 736 pounds of copper, and 6,674 pounds of lead, valued in all at $14,343, or $20.26 a ton. Of the ore produced 500 tons were milled, yielding 31 tons of concentrates, and 188 tons were treated in amalgamation mills, yielding gold and silver bullion. Only 20 tons of ore, containing lead and copper, were of shipping grade. The producers were the Carnation, Silver Legion, Rand, Campbell, and Techatticup properties.

Searchlight district.—Five producers in the Searchlight district reported 2,833 tons of ore, which yielded $68,505 in gold, 2,586 ounces of silver, 14,974 pounds of copper, and 86,768 pounds of lead, valued in all at $79,975, or $28.23 a ton. The larger part of the ore was treated in an amalgamation mill, producing gold and silver bullion and some lead concentrate. The ore of shipping grade amounted to 347 tons and yielded 269.46 ounces of gold, 1,962 ounces of silver, 14,000 pounds of copper, and 59,667 pounds of lead. The Duplex mine, which produces milling ore and some rich ore of shipping grade, is opened by an inclined shaft 800 feet deep. The ore contained gold and silver, recovered by amalgamation, and some lead carbonate, recovered by flotation. Other properties producing gold and silver recovered by amalgamation were the Sam Yet, St. Louis, and Red Bird mines.

Yellow Pine district.—Twenty-three producers in the Yellow Pine district reported an output of 18,265 tons of ore and 2,170 tons of old tailing. Most of the output came from the property of the Yellow Pine Mining Co. The yield of the district was $298 in gold, 72,045 ounces of silver, 6,900 pounds of copper, 5,287,587 pounds of lead, and 6,230,664 pounds of zinc, valued in all at $984,827, or $48.19 in metals a ton of ore and tailing. The ore of shipping grade, mostly carbonate, amounted to 11,695 tons and yielded $20 in gold, 41,413 ounces of silver, 3,675,887 pounds of lead, and 3,974,258 pounds of zinc. A new concentrator for the treatment of ore from the Yellow Pine mine was completed in 1925, but it was operated only three months, as there was little developed ore on hand. Lessees shipped crude lead-zinc ore and re-treated old tailing from the Bullion and Anchor mines. Some lead ore was concentrated at the Sultan mill, and zinc ore was shipped from the Potosi mine to the custom plant at International, Utah, for milling. In all, 6,570 tons of ore and 2,170 tons of old tailing from the district were concentrated, producing 4,830 tons of concentrates which were classified as 567 tons of lead concentrate, 3,343 tons of zinc-lead concentrate, and 920 tons of zinc concentrate. The zinc-lead and zinc concentrate yielded 2,256,406 pounds of zinc recovered as zinc oxide or metallic zinc.

The Yellow Pine mine[1] produced oxidized lead and lead-zinc ore which yielded shipping products that sold for $368,835. About 15,000 tons of ore were mined, part of which was treated in the newly completed 100-ton concentration mill. Lead concentrate was shipped to Murray, Utah, and lead-zinc concentrate, calcined at the mill, and oxidized lead-zinc ore were shipped to the eastern zinc plants of the Ozark Smelting & Mining Co. and the Grasselli Chem-

[1] Yellow Pine Mining Co., ann. statement, 1925.

ical Co. Dividends paid to stockholders during the year amounted to $160,000, making a total of $3,044,000 to the end of 1925.

The demand for sulphide zinc ore resulted in the reopening of the Potosi mine by lessees, who reported the shipment of 1,350 tons of mill ore that was treated at a custom plant in Utah. Included in the output was one lot of first-class lead ore, which was smelted. The ore produced was hauled 14 miles east to Arden, a station on the Union Pacific Railroad. The Potosi property is the oldest mine in Nevada, and was recorded among the earliest patents in the State. In January, 1857, a "Mormon" association composed of members of the Las Vegas mission smelted the first ore, and produced about 9,000 pounds of metal, which was found to be worthless for the purpose intended on account of an excess of zinc. Prospecting for lead was abandoned the following month. The Potosi mine is said to have produced over $4,000,000 in silver, lead, and zinc. Other producers in 1925 were the Ingomar, Milford, Maiden Rock, May Kirby, Mountain Top, Over group, Hermosa, Pilgrim, White Elephant, Zincite, Porter, Creed, Contact, and Big Blossom claims.

DOUGLAS COUNTY

Mountain House district.—From the Ventura property of the Carson Valley Mining Co. a small quantity of gold bullion was recovered by amalgamation.

ELKO COUNTY

In 1925 the mine production in Elko County, made by 43 producers, showed increases in all metals except gold. The output of silver increased from 136,361 to 144,846 fine ounces, copper from 20,986 to 176,887 pounds, lead from 1,553,842 to 3,103,846 pounds, and the total value of the metal output from $804,052 to $950,398. Zinc produced in 1925 amounted to 23,781 pounds; none was produced in 1924. The yield of ore, etc., decreased from 70,352 to 67,294 tons, and of gold from $585,634 to $552,916.

Contact district (*Salmon River*).—Altogether 350 tons of ore were produced, yielding $228 in gold, 1,374 ounces of silver, and 70,788 pounds of copper, valued in all at $11,234, or $32.10 a ton. All of this ore was hauled to the Rogerson-Wells branch of the Oregon Short Line Railroad recently completed through the district. Most of the output was mined from the Delano property, which is opened by two shafts, 200 and 300 feet deep, and a 1,500-foot tunnel. The property is equipped with a 100-ton hand sorting and crushing plant, in which the ore is crushed to an average size of 3 inches.

Cope district.—The Silver Banner property produced one lot of siliceous silver ore which was shipped for testing.

Delano district.—The Net No. 2 mine of the Panther Mines Co. was being developed and a new concentrating mill having a daily capacity of 25 tons was installed. The company shipped 245 tons of crude lead ore and 147 tons of lead concentrate. The mine is opened by an inclined shaft 650 feet deep and has 1,000 feet of drifts.

Ferber district.—At the Shaffer property, 15 miles from Ibapah, some sulphide copper ore was mined and loaded at Dunlop, a Utah station of the Deep Creek branch of the Western Pacific Railroad.

Gold Circle district (*Midas*).—Five producers—the Colorado Grande, Esmeralda, Homestake, Gold Circle Queen, and Last Chance mines—reported 61 tons of ore which yielded $680 in gold and 41 ounces of silver, valued together at $708, or $11.61 a ton. All the ore was treated in amalgamation mills, yielding bullion containing gold and silver.

Granite district.—Three producers in the Granite district reported 84 tons of ore yielding $23 in gold, 1,017 ounces of silver, 4,780 pounds of copper, and 16,590 pounds of lead, valued in all at $2,851, or $33.94 a ton. All the ore was of shipping grade and was mined from the Dolly Varden Queen mine and from two small prospects.

Island Mountain district.—From the Orofino claim and the Gold Center group 3 tons of gold ore taken out during development work were shipped for testing.

Jarbidge district.—Five operators of lode mines reported the production of $550,206 in gold and 34,506 ounces of silver, valued together at $574,153, or $10.24 a ton. Mining was done in the Long Hike property belonging to the Elkoro Mines Co., the Bluster group of the United Eastern Mining Co., and the Alpha mine of the Jarbidge Nevada Mining Co.

Mining proved profitable in the property of the Elkoro Mines Co.,[2] but the known ore was virtually exhausted in the Long Hike mine, as well as in the property of the Jarbidge Gold Mining Co. (Ltd.), a subsidiary. A total of 53,592 tons of ore was milled, yielding $556,066 in gold and silver, or an average of $10.38 a ton. The total cost of mining and milling, excluding depreciation and development, was $283,457, or $5.29 a ton. In connection with current development work $44,166 was charged off, leaving an operating profit of $228,443. Development of leased properties cost $26,591. In 1925 no appreciable quantity of commercial ore was added to the reserves, and the year closed with only enough ore developed to keep the mill running at full capacity for a few months. Future operations depend on the finding of new ore bodies by means of the prospect tunnels now being driven. The company was third in the production of gold in Nevada during the year, operated a 150-ton cyanidation mill continuously, and did an unusual amount of development work. The Bluster, Success, and Pick & Shovel groups, operated under lease by the United Eastern Mining Co., reported a fair production of gold-silver bullion. About 3,000 feet of development work was done during the year, and a 100-ton cyanidation mill was operated in December.

Lafayette district.—A test lot of lead ore containing silver was shipped from a prospect 4 miles north of Tobar.

Merrimac district.—Regular development work is being carried on at the Rip Van Winkle property and shipments of first-class lead ore containing silver amounted to 165 tons.

Mud Springs district.—The Silver Butte Consolidated Mining Co. and the Fasano claims were producers of lead ore which was hauled 30 miles to the station at Currie, on the Nevada Northern Railroad, and shipped to a lead smelter near Salt Lake City, Utah. The Silver

[2] Yukon Gold Co. Ann. Rept. for 1925.

Butte property is opened by a 100-foot vertical shaft and 435 feet of drifts.

Railroad district.—The Nevada Bunker Hill Mining Co. sold the slag dump at the old Bullion smelter; 3,941 dry tons of slag containing considerable silver and lead were shipped to smelters in Utah and California. Two 5-ton trucks were used to haul the slag 27 miles to Elko at a cost of $7 a ton. The company owns the old town of Bullion, where the smelter was situated, and 22 claims, including the Tripoli mine, and has control of the Standing Elk, Hoffman, and Cleveland mines. Silver-lead ore occurs in limestone, copper-silver ore in porphyry contacts, and siliceous copper ore in porphyry intrusions. Development has been going on for several years, and a tunnel has been driven 3,775 feet to cut the Tripoli vein 3,200 feet from the portal. A recently organized leasing company will continue the work of opening up the property.

Ruby Mountain Range district.—Four producers in the Ruby Mountain Range district reported 1,135 tons of ore, which yielded $4 in gold, 913 ounces of silver, 77 pounds of copper, 179,056 pounds of lead, and 23,781 pounds of zinc, valued in all at $18,034, or $15.89 a ton. All the ore except 135 tons of shipping grade was concentrated in a 25-ton mill at the L. C. mine. Oxidized zinc ore, as well as some lead ore, was shipped from the Michigan property; the zinc ore, averaging 36.46 per cent of zinc, was shipped to Amarillo, Tex. Lead ore was also produced from the Fordham and the Lead King properties which were worked by lessees.

Spruce Mountain district.—Some lead ore was shipped from the Bullshead and Ada H properties, but most of the district output came from the Black Forest and Spruce Monarch properties. The Black Forest mine, high on the east side of Spruce Mountain, produced oxidized lead ore which was hauled in wagons to the foot of the mountain and then on trucks 18½ miles northeast to Jasper, a station on the Western Pacific Railroad. The mine is developed by a 900-foot tunnel and several shallow winzes. While cleaning out the old drifts, which was the principal work in 1925, 2,823 tons of lead ore were shipped to Utah. The company was paid for 38,212 ounces of silver and 704,775 pounds of lead in this ore, but not for any gold or copper. The Spruce Monarch mine is on the west side of Spruce Mountain, and ore is hauled to Tobar on the Western Pacific Railroad. In 1,276 tons of oxidized lead ore which were shipped for smelting the company was paid for 23,724 ounces of silver and 438,113 pounds of lead, but not for the small quantity of copper and gold contained in the ore. Most of the development work was confined to the 520-foot level and the winze from the 400-foot level. The upper workings were leased.

Tecoma district.—Five producers reported 232 tons of ore, which yielded $50 in gold, 1,009 ounces of silver, and 81,401 pounds of lead, valued in all at $7,832, or $33.76 a ton. The mines lie 8 miles east of Montello, the loading station on the Southern Pacific Railroad. The producers of lead ore were the Cunapah, Jackson, Davenport, and two prospects.

Tuscarora district.—One shipment of copper ore and a small lot of siliceous silver ore were shipped to the smelter from the vicinity

of Tuscarora. The Nevada claim was prospected by a vertical shaft 40 feet deep and a tunnel 200 feet long.

Warm Creek district.—The Parker claim, 15 miles west of Tobar, produced one lot of oxidized ore averaging 36 ounces of silver to the ton, 26 per cent of lead, and 11 per cent of zinc.

ESMERALDA COUNTY

The mine production in Esmeralda County showed increases in three metals—the yield of silver increased from 121,336 to 124,680 ounces and lead from 107,674 to 236,792 pounds. The zinc output amounted to 5,783 pounds in 1925; none was produced in 1924. The yield of ore and old tailings decreased from 19,782 to 12,014 tons, gold from $271,093 to $177,425, copper from 19,394 to 7,254 pounds, and the total value of the metals from $363,543 to $286,023. There were 38 producers, four less than in 1924.

Alpine district.—The Treasure Hill property produced one car of siliceous gold ore, which was shipped to Millers for treatment in a custom cyanidation mill.

Desert district (Gilbert).—The Last Hope mine produced siliceous gold ore, which was hauled 14 miles to a custom mill at Millers for treatment by cyanidation. During 1925, 2,500 feet of development work was done on the property, which is opened by a tunnel 200 feet long, an inclined shaft, and several drifts. The Homestake mine also produced gold ore which was treated at Millers.

Divide (Gold Mountain) district.—From the Tonopah Divide and Hasbrook properties 1,588 tons of siliceous silver ore were produced. Nearly all the output was treated at cyanidation plants at Tonopah and Millers.

The Tonopah Divide property[3] was worked by lessees who produced ore paying royalties amounting to $7,729. The Tonopah Divide Mining Co. confined development work mainly to the Midway mine at Tonopah.

Dyer district.—The Queen of the Hills property produced several cars of silver ore containing a little copper and lead, which was shipped to California for smelting.

Goldfield district.—Nine producers, most of them lessees, worked in the mines at Goldfield; they produced 2,773 tons of ore and old tailings which yielded $104,455 in gold, 2,369 ounces of silver, and 4,156 pounds of copper, valued in all at $106,689, or $38.47 a ton. Most of the ore came from the Goldfield Consolidated property and the remainder from the Combination Fraction, Florence, Great Bend, Red Hill Florence, and Sandstorm mines. About half of it was shipped for smelting, and half was treated by cyanidation at Millers and Tonopah.

Hornsilver district.—The Southwestern property of the Nevada Silver Mines Co. yielded some lead-silver ore, consisting of oxidized lead ore which was shipped to smelters near Salt Lake City, Utah. The Orleans mine yielded siliceous gold and silver ore which was shipped for treatment in a mill at Tonopah. Hornsilver is 36 miles south of Goldfield; after a haul of 16 miles, the ore is loaded at Stonewall siding on the Tonopah & Tidewater Railroad.

[3] Tonopah Divide Mining Co. Ann. Rept. for 1925.

Klondyke district.—Several cars of siliceous silver ore were shipped from the Marinette property to the copper smelter at Kennett, Calif.

Lida district (Tule Canyon).—The Boxer claims, 45 miles from Goldfield, were worked by a lessee who mined a small quantity of siliceous silver ore. This ore and a small lot from the Kangaroo claim were sold to the smelter at Kennett, Calif. Some lead-zinc ore of milling grade from the Syncline property was shipped to a custom concentration plant near Salt Lake City, Utah.

Lone Mountain district.—The General Thomas mine, 16 miles west of Tonopah, was controlled by the Gold Zone Mining Co., which ran a small dry mill using a Stebbins concentrator. Lead concentrate, with the lead ore of shipping grade, was shipped from the Lead King mine to a smelter near Salt Lake City, Utah.

Montezuma district.—The Monitor mine produced several cars of oxidized lead ore which was shipped to Utah for smelting. One lot of similar material was shipped from the Montezuma claim.

Silver Peak district.—Five operators of lode mines in the Silver Peak district reported the production of 1,623 tons of ore and old tailing, which yielded $39,010 in gold and 2,478 ounces of silver, valued together at $40,730, or $25.10 a ton. The Mary mine, operated by the Lucky Boy Divide Mining Co. and other lessees, was the largest producer. Part of the ore was treated locally by amalgamation, part was sent to a custom cyanidation mill at Millers, and the remainder was shipped directly to the smelters at Kennett, Calif., and Thompson, Nev. Gold ore was also produced at the Valcalda mine, and silver ore from the Vanderbilt & Vulcan property. Old tailing from the Great Gulch mine was treated by cyanidation.

Tokop (Gold Mountain) district.—One lot of oxidized lead ore was shipped from the Courbet and May Day claims and a little siliceous silver ore from the Banner property.

Tonopah district.—The output of silver ore from the part of the Tonopah district in Esmeralda County showed a fair increase. Three producers reported an output of 4,730 tons of ore which yielded $9,888 in gold and 51,351 ounces of silver, valued together at $45,526, or $9.62 a ton. Ore was mined from the Tonopah "76," the West End Extension properties, and McKane 1,200-foot workings of the Tonopah Extension Co. Further information will be found under Nye County, in which this district largely lies.

Windypah district.—The Ruth claim, opened by a vertical shaft 77 feet deep, produced 6 tons of oxidized lead ore, which were hauled 44 miles to Goldfield for shipment.

EUREKA COUNTY

The number of producers in Eureka County increased (from 11 in 1924 to 17 in 1925) as well as the mine production of the metals except copper. The output of ore, etc., increased from 20,026 to 31,050 tons, gold from $31,250 to $35,281, silver from 49,414 to 101,843 fine ounces, lead from 1,776,927 to 4,331,011 pounds, and the total value of the metal output from $227,516 to $486,444. The yield of copper decreased from 160,344 to 25,955 pounds.

Eureka district.—Twelve operators of lode mines in the Eureka district produced 31,004 tons of ore and slag, yielding $31,816 in gold, 101,703 ounces of silver, 25,955 pounds of copper, and 4,326,303

pounds of lead, valued in all at $482,472, or $15.56 a ton. Most of the output (25,908 tons) was of milling grade, and produced 2,864 tons of concentrate, which yielded gold, silver, copper, and lead. The ore of shipping grade amounted to 5,037 tons, yielding 1,275.02 ounces of gold, 57,257 ounces of silver, 22,406 pounds of copper, and 1,757,944 pounds of lead. One small lot of gold ore was treated by cyanidation. The chief mining operations were by the Eureka Holly Mining Co., whose mine and mill were continuously active. First-class carbonate lead ore was shipped to Utah for smelting, and a carbonate lead concentrate was recovered by table concentration and flotation after sulphidizing. Lessees working the Richmond-Eureka mine shipped 4,892 wet tons of silver-lead ore to Midvale, Utah. Exploration work was continued in certain parts of the mine by the Richmond-Eureka Mining Co., which is controlled by the United States Smelting, Refining & Mining Co. Several small lots of sorted slag were shipped from the Silver West dump. Oxidized lead ore was shipped from the Excelsior, Helen Mortimer, Hidden Treasure, Eureka-Nevada, and the Nevada Exploration properties, and some mill ore from the Williamsburg mine was treated in the Eureka Holly plant.

Lynn district.—Although the Lynn Big Six mine and mill were not operated, one car of rich gold ore was shipped to Utah for smelting. Two placer operators reported an output of gold dust which, with the ore shipped, was valued at $3,453.

HUMBOLDT COUNTY

Amos district (*Slumbering Hills*).—Siliceous gold ore from the Daveytown and Sage Hen properties was treated by amalgamation, and gold valued at $3.647, with 50 ounces of silver, was recovered from the resulting bullion.

Black Rock district.—One lot of silver ore was shipped from the Grubstake claim.

Gold Run district (*Adelaide*).—The Great Republic mine, 14 miles south of Golconda, yielded a small lot of oxidized lead ore, averaging $3.20 in gold and 33 ounces of silver a ton, and 18 per cent of lead.

Iron Point district.—Several cars of silver ore from the Silver King property were shipped to the smelter at Kennett, Calif.

National district.—Ore from the Bell and Ward claims was milled by the California National Gold Mining Co., and one car of rich gold and silver concentrate was shipped to Selby, Calif.

Red Butte district.—The Orphan property of the Juniper Hills Mining Co., 25 miles northwest from Jungo, produced one car of oxidized lead ore, averaging 52 ounces of silver to the ton and 4 per cent of lead.

Ten Mile district.—The district output of gold and silver, valued at $1,467, was recovered chiefly from one lot of gold ore from the Stuttie claim and from bullion saved at the Red Boy group, about 10 miles northwest of Winnemucca.

LANDER COUNTY

Battle Mountain district.—The metal output of the Battle Mountain district from lode and placer mines consisted of $11,644 in

gold, 2,470 ounces of silver, 504 pounds of copper, and 3,913 pounds of lead, valued in all at $13,770. Six operators of lode mines reported 641 tons of ore, 383 tons of which were treated by amalgamation and cyanidation, yielding 191.43 ounces of gold and 81 ounces of silver. Crude shipping ore aggregated 258 tons and yielded 178 ounces of gold, 2,358 ounces of silver, 504 pounds of copper, and 3,913 pounds of lead. The output of seven placer operators was valued at $4,029. The largest producer was the Buffalo Valley Mines Co., working property 18 miles south of Valmy. During the year 253 tons of ore were treated by cyanidation in a 10-ton mill, producing gold and silver bullion, and 220 tons of richer ore were shipped to Kennett, Calif., for smelting. The mine is opened by a 90-foot vertical shaft and has a tunnel 600 feet long. Other producers of siliceous gold ore were the Golden Sceptre, Buzzard, Nicklas, and Tom Boy claims. The Buckingham-Mina property, which produced 26 tons of sorted silver-lead ore mined in the course of development work, is opened by four inclined shafts, the deepest of which is 286 feet, and drifts and tunnels aggregating 7,000 feet.

Bullion district.—Four producers in the Bullion district reported 672 tons of ore, all of which was of shipping grade, yielding $2,501 in gold, 19,395 ounces of silver, 44,475 pounds of copper, and 99,970 pounds of lead, valued in all at $30,973, or $46.09 a ton. Several hundred tons of copper ore were shipped from the Gem property, 35 miles southwest of Beowawe, a loading station on the Southern Pacific Railroad. The ore, containing arsenic as well as gold, silver, and copper, was shipped to a smelter near Salt Lake City, Utah. Silver-lead ore amounting to 135 tons was shipped from the Utah mine, operated by the Mineral Range Mining Co. The mine is opened by a vertical shaft 172 feet deep, 1,400 feet of drifts, and a tunnel 500 feet long. About 20,000 tons of ore are estimated to be in reserve. In September the Nevada-Mexico Mining Corporation began developing the Lovey property, 1 mile from Lander, and shipped a little silver ore and sulphide lead ore.

Cortez district.—According to the Nevada Mining Press of September 18, 1925, approximately 100 tons of ore a day were being treated in the concentration-cyanidation plant of the Consolidated Cortez Silver Mines Co.; the ore came from the stoped areas on the upper levels above the Garrison tunnel. The ore is treated by concentration followed by cyanidation, and the mill heads averaged about 14 ounces of silver to the ton, with a little gold. According to some of the smelter returns, the average content of the concentrate was $2 in gold and 115 ounces of silver to the ton, 6 per cent of lead, and 3 per cent of copper. A recovery of 84 per cent of silver and 90 per cent of gold was reported. A force of 40 men was employed, and several lessees were also working in the Garrison section of the mine. In 1925 the company was the seventh largest producer of silver in Nevada.

Hilltop district.—Four operators of lode mines reported the production of 122 tons of ore of shipping grade, which yielded $668 in gold, 16,586 ounces of silver, 908 pounds of copper, and 4,351 pounds of lead, valued in all at $12,687, or $103.99 a ton. The bulk of the output was siliceous silver ore of shipping grade from the Blue Dick, Aztec, and Neff mines; one carload of sulphide lead ore carrying considerable silver was shipped from the Grey Eagle mine.

Jackson (Gold Park) district.—A small test lot of gold bullion was shipped from the Gold Park mine—the first activity in the district since 1921, when a 50-ton mill equipped for amalgamation, concentration, and flotation was built. Some gold bullion and concentrate were shipped at that time from the Star of the West mine.

Lewis district.—According to its annual report to stockholders, the Betty O'Neal mine[4] produced 34,100 tons of ore, of which 23,290 tons were milled and 10,810 tons were placed on the dump. From the milling ore 1,219 tons of concentrate were recovered which contained 506,500 ounces of silver, an average of 415.5 ounces to the ton of concentrate, 45,875 pounds of copper, 158,067 pounds of lead, and 36.89 ounces of gold, valued in all at $372,405, or a net smelter return of $313,503 after deduction of the freight charge of $16,487 and the smelter treatment charge of $42,415. The average value of the ore milled, in terms of net smelter returns, was $13.46 a ton. The ratio of concentration was 19 tons of ore to 1 ton of concentrate. The mining and development cost was $6.96, milling $2.62, and indirect charges $1.22, or a total of $10.80 a ton. The dividends paid stockholders in 1925 amounted to $43,379.90. Ore reserves are estimated at 148,000 tons, averaging about 20 ounces of silver to the ton. The ore in the Estella vein, between the north 150 level and north 5 level, has been thoroughly prospected and blocked out ready for stoping. A car of concentrate shipped to Midvale, Utah, in September netted the company $16,053; it assayed 60 cents in gold and 567.7 ounces of silver to the ton, 2.95 per cent of copper, 10.13 per cent of lead, 11.25 per cent of zinc, 22 per cent of insoluble, and 21.9 per cent of sulphur.

The Celestine O'Neal property, which has a small amalgamation mill, was being developed.

Reese River district.—No ore was shipped from the mines near Austin, although some development work was done at several properties.

LINCOLN COUNTY

The number of producers in Lincoln County increased from 13 in 1924 to 17 in 1925. The output of ore decreased from 74,283 to 63,498 tons, gold from $65,826 to $29,731, and silver from 420,943 to 403,748 fine ounces. The output of copper increased from 144,650 to 229,034 pounds, lead from 4,851,928 to 6,418,524 pounds, zinc from 3,074,843 to 8,049,995 pounds, and the total value of the metals from $954,826 to $1,512,667.

Caliente (Chief) district.—The Republic group, 7 miles north of Caliente, was worked the first three months of 1925, and 42 tons of carbonate lead ore containing silver and gold were shipped to a smelter near Salt Lake City, Utah.

Comet district.—The Stella, Mountain Lion, and Tungsten Comet properties yielded 1,815 tons of ore, most of which was lead ore of milling grade mined at the Comet property. This property is equipped with a 50-ton flotation plant and is opened by a shaft 480 feet deep. Ore and concentrate were hauled 20 miles to Comet, a siding on the Union Pacific Railroad.

[4] Betty O'Neal Mines Co. Ann. Rept. for 1925.

Frieberg district.—The Vaquero Mines Co. developed claims in Lincoln County south of Sharp, Nye County, and shipped 18 tons of silver-bearing lead ore.

Groom district.—The Groom and Kelly properties produced 327 tons of rich lead ore which yielded $13 in gold, 4,708 ounces of silver, 1,274 pounds of copper, and 307,245 pounds of lead, valued in all at $30,191, or $92.33 a ton.

Jack Rabbit district.—The mine output of the Jack Rabbit district, reported by the Bristol Silver Mines Co. and the Pioche Bristol Co., consisted of 2,791 tons of ore which yielded $1,050 in gold, 40,894 ounces of silver, 107,581 pounds of copper, and 447,715 pounds of lead, valued in all at $83,659, or $29.97 a ton. The Bristol Silver property is opened by a 70° inclined shaft 1,100 feet deep, but little development work was done in 1925. In September a 240-horsepower Fairbanks Morse Diesel power plant was installed.

Pahranagat district (*Hiko*).—One lot of copper-lead ore from the Treasure and Rosie claims was hauled 55 miles to Caliente and shipped to Salt Lake City, Utah.

Patterson district.—The Ely-Pioche Amalgamated Lead-Silver Mines Co. shipped one lot of oxidized lead ore while doing development work on claims in Cave Valley.

Pioche district.—Four producers of ore in the Pioche district reported the output of 58,422 tons, yielding $26,264 in gold, 350,825 ounces of silver, 117,998 pounds of copper, 5,611,259 pounds of lead, and 8,038,744 pounds of zinc, valued in all at $1,385,618, or $23.72 a ton. Most of the output was lead-zinc ore from the Panaca property of the Combined Metals Reduction Co.; it was shipped for milling at Bauer, Utah, where it yielded lead concentrate and zinc concentrate in a 200-ton selective flotation plant. A section of the plant is designed to leach silver-lead concentrate in an acid brine and to precipitate lead chloride, which is reduced to pig lead. The process was still in the experimental stage at the end of 1925. The Panaca mine is opened by two vertical shafts, 450 and 1,200 feet deep, and by approximately 2 miles of other workings. About 5,000 feet of development work was done in 1925, and the mine became the largest producer of zinc in Nevada. The Prince mine produced two cars of silver ore and ore containing lead and zinc, which were shipped to Salt Lake City, Utah, for milling. The Virginia Louise mine, under lease to the Prince Consolidated Mining Co., produced 18,117 tons of oxidized ore, averaging 2 ounces of silver to the ton, 2.5 per cent of lead, and 0.1 per cent of copper, as well as iron and manganese. This material was used as a flux at the smelter at Midvale, Utah.

Tem Piute district.—Several cars of siliceous silver ore from the Tem Piute claim were shipped to a copper plant in Utah for smelting.

Viola district.—From the Rowenite prospect 20 tons of oxidized lead-zinc ore assaying 33.4 per cent of zinc and 4.8 per cent of lead were hauled 14 miles northwest to Carp, a station on the Union Pacific Railroad, and then shipped to an eastern zinc plant.

LYON COUNTY

In Lyon County the production of ore and old tailings increased from 2,998 to 3,124 tons and copper from 10,938 to 43,135 pounds. The yield of gold decreased from $22,583 to $14,741, silver from

9,626 to 5,877 fine ounces, and the total value of the metals from $30,465 to $24,945. Fourteen producers reported yields, two more than in 1924.

Silver City district (*Palmyra, Dayton, Como*).—Eleven producers reported 2,624 tons of ore and old tailings, which yielded $14,658 in gold, 5,866 ounces of silver, and 285 pounds of copper, valued in all at $18,769. Old tailing treated by cyanidation and ore by amalgamation yielded 663.11 ounces of gold and 3,982 ounces of silver. The clean-up of an old cyanide plant is included in this output. Nineteen tons of concentrate yielded 21.39 ounces of gold, 1,632 ounces of silver, and 285 pounds of copper. The concentrate was recovered by flotation from the old Douglas tailing dump, 4½ miles northeast of Dayton. These old mill tailings contain mercury, which is recovered by roasting the concentrate. The roasted concentrate containing silver was shipped to the Mason Valley smelter at Thompson. The dump is estimated to contain 450,000 tons of tailing, averaging $6 in gold, silver, and mercury. The ratio of concentration was 100 to 1, and the concentrate contained 140 to 160 pounds of mercury to the ton, 75 per cent of which is said to be recovered. The mill, run by electric power, is equipped for flotation and has two Kraut roughers of 5 cells each and one cleaner of 3 cells. The Oest property was the largest producer of milling ore, although several lots were mined from the Silver King, New Bonanza, and Buckeye mines.

Yerington district.—As soon as the mines of the Mason Valley Mines Co. can be brought to full production the smelter at Thompson will be started. The properties [5] will operate in 1926 under conditions quite different from those existing when production ceased in March, 1919. At that time most of the ore was smelted, but it is now found more economical to treat the sulphide ore by flotation. The Bluestone mill has been enlarged by the Mason Valley Mines Co., and the plant will treat ores from the Mason Valley as well as Bluestone ore; the concentrate and oxidized copper will go to the smelter at Thompson. On February 27, 1926, the first unit of the concentration plant was opened, and stock piles of ore at Thompson were large enough to start the smelter.

Lessees shipped 170 tons of copper ore from the Empire Nevada property to Kennett, Calif., and several cars of low-grade siliceous ore containing copper were shipped from the property of the Nevada Douglas Co. to Thompson.

MINERAL COUNTY

The production of ore by 35 operators in Mineral County increased from 5,010 tons in 1924 to 33,907 tons in 1925, gold from $40,237 to $59,999, silver from 103,956 to 313,847 fine ounces, copper from 1,726 to 13,282 pounds, lead from 96,068 to 740,007 pounds, and the total value of the metal output from $117,798 to $363,456. Temporary resumption of work in the Bell district resulted in the output of 255,000 pounds of zinc; no zinc products were marketed in 1924.

Bell district (*Mina, Omco*).—Additional milling ore, estimated at 58,000 tons, was developed at the Simon Silver-Lead property [6] in

[5] Mason Valley Mines Co. Ann. Rept. for 1925.
[6] Simon Silver-Lead Mines (Inc.), financial statement to stockholders, dated May 3, 1926, for year 1925.

1925, making a total ore reserve of 115,000 tons. Early in 1925 the milling plant ran for three months at a cost of $65,593, and the concentrates produced sold for $32.524. After June, 3,119 feet of development work was done, and the main shaft was completed to the 800-foot level. The management decided to study the structural conditions of the mine more thoroughly and develop the ore on the 800-foot level before proceeding to undertake milling. A new vein opened on the 700-foot level was said to assay 7 per cent of lead, 5 per cent of zinc, and 5 ounces of silver to the ton.

Buena Vista district.—The mine production of gold and silver in the Buena Vista district was valued at $901. Gold bullion was recovered by amalgamation at the Golden Gate mine, and 35 tons of siliceous silver ore was shipped from the Silver Trail property to Kennett, Calif.

Columbus district.—The New Candelaria Mines Co., working several old properties in the Columbus district, treated 23.127 tons of silver ore by cyanidation, after which the mill was closed in September. Development was continued with the hope of opening enough first-class shipping ore to pay at least in part for the development of the property. Some sulphide ore containing 20 to 35 ounces of silver to the ton was blocked out, and favorable arrangements were made for smelting it at the Mason Valley plant at Thompson.

Garfield district.—The only producer in the Garfield district was the Mabel mine,[1] which joins the Garfield mine 15 miles northwest of Mina. A profit of $31,352 was realized from first-class shipping ore after deducting costs for development work, taxes, and depreciation. Shipments of ore aggregated 927 tons, averaging $116.75 a ton in gold, silver, and lead. During the last quarter of 1925 the output averaged one car a month, the October shipment assaying 160 ounces of silver and 2 ounces of gold to the ton, and 12 per cent of lead. Ore has been mined from 80 feet above the tunnel level to the 500-foot level, from which a winze was sunk 60 feet.

Hawthorne and Pamlico districts.—Three mine operators in the Hawthorne district produced 31 tons of ore, yielding gold, silver, and a little lead, valued at $4,222, or $136.19 a ton. A test lot of lead ore was shipped from the Lucky Boy mine, operated by the Hawthorne Mines (Inc.), which built a 200-ton concentration-flotation mill during 1925. The company reports that 200,000 tons of ore has been developed, which averages 20 ounces of silver to the ton and 5 per cent of lead. A test lot of ore from the Good Hope property was shipped to the sampler at Hazen. From the Gold Bug mine in the Pamlico section 68 ounces of gold were recovered from 1½ tons of ore treated by amalgamation.

Rand district.—In the course of development several cars of rich ore were shipped from the Gold Pen and Rand properties. The Gold Pen mine produced high-grade gold ore, part of which was shipped for smelting and the remainder to an amalgamation mill at Olinghouse in Washoe County. One lot of 1.4 tons of ore, assaying 40 ounces of gold and 70 ounces of silver to the ton, and another lot of 14 tons, carrying 6.25 ounces of gold and 8 ounces of silver to the ton, were sold to the ore sampler at Hazen. Six cars of gold-silver ore, averaging about $10 in gold and 20 ounces of silver to

[1] West End Consolidated Mining Co. Nineteenth Ann. Rept., for 1925.

the ton, were shipped from the Rand mine, where a deposit of oxidized and sulphide ore occurs as a replacement in andesite. The ore, part of which was treated by cyanidation at Millers, was hauled 17 miles to Nolan, a station on the Southern Pacific Railroad, at a cost of $3 a ton.

Regent district (*Rawhide*).—Six producers in the Regent district reported the output of 36 tons of ore; 19 tons of it were of shipping grade and 17 tons were treated by amalgamation and cyanidation. The metal recovered, valued at $5,551, consisted of $2,543 in gold, 4,324 ounces of silver, and a little copper and lead. Lessees working the Nevada New mines, property of the Scheeline estate, shipped one lot of gold ore, treated at a custom cyanidation plant, and a small car of rich gold and silver ore which was smelted. Other producers were the Morning Star, Patsy V, Corrine, and Victory mines.

Santa Fe district (*Kinkead*, *Hawthorne*).—The Confidence and Mary mines produced 50 tons of siliceous silver ore, which were sold to local ore buyers. The Confidence property is about 6 miles north of Kinkead on the Southern Pacific Railroad.

Silver Star district (*Marietta*, *Black Mountain*).—Nine producers reported an output of 390 tons of ore, yielding $9,767 in gold, 3,329 ounces of silver, 1,229 pounds of copper, and 22,955 pounds of lead, valued in all at $14,249, or $36.54 a ton. About half of the ore was treated by amalgamation in a small mill of the Nevada Douglas Gold Mines (Inc.), operating property 8 miles southwest of Mina. This company ordered machinery for a new 100-ton cyanidation plant.

With the exception of the output of the Sunnyside property, which produced rich gold ore that was shipped to a smelter at Kennett, Calif., and one lot of silver ore from the Endowment mine, the shipping product was lead ore from the Black Mountain, Gold Scratch, Great Western, Blackhawk, and Tri-Metallic properties.

Sodaville district (*Pilot Mountains*).—The Kismet group of claims, 6 miles east of Mina and 4 miles west of Pilot Peak, is opened by a tunnel 800 feet long. A trial shipment of 11 tons of oxidized lead ore assayed 4.5 per cent of lead and contained $6.80 in gold and 16 ounces of silver to the ton.

NYE COUNTY

The number of producers in Nye County decreased from 69 in 1924 to 67 in 1925, the output of ore from 302,894 to 205,195 tons, gold from $1,470,855 to $874,322, silver from 5,029,825 to 3,098,513 fine ounces, and the total value of the metal output from $4,847,716 to $3,086,441. The output of copper increased from 1,694 to 6,624 pounds, and lead from 83,201 to 698,965 pounds. The placer output of gold and silver, included above, increased from $19,083 to $45,463 in gold and from 461 to 1,236 fine ounces of silver, and the value of both metals from $19,392 to $46,321.

Bannack district.—One lot of siliceous silver ore from the Sylvanite prospect was shipped to Millers for treatment in the custom cyanidation plant.

Bellehellen district.—The output of the district came mainly from the Clifford property, which produced several hundred tons of gold

and silver ore. The ore was hauled 35 miles to Tonopah and treated in a custom cyanidation plant.

Bruner district (Phonolite).—During January and May the Derelict claim, under development, produced a small lot of high-grade silver ore. The property is opened by a vertical shaft 280 feet deep and has 200 feet of drifts.

Bullfrog district.—The Original Bullfrog property, the only producing mine in the district, was operated by a lessee who shipped 17 tons of gold and silver ore.

Cloverdale or Golden district.—Some gold bullion containing silver was recovered from ore treated by amalgamation at the Nick Dunn property.

Fairplay or Goldyke district.—The Gold Boy claim produced a little milling ore, from which gold bullion was recovered by amalgamation.

Hannapah district.—One ton of rich silver ore from the Edner property was shipped to California for smelting, and a test was made at Millers on ore from the Silver Leaf mine.

Johnnie district.—Gold bullion recovered from ore treated at the Johnnie and Eureka Johnnie properties was shipped to San Francisco, Calif. Most of the output was low-grade gold ore from the Johnnie mine and was treated locally by amalgamation.

Mammoth or Lodi district.—At Quartz Mountain the lessees of the San Rafael property produced 1,734 tons of ore, yielding 684.93 ounces of gold, 39,838 ounces of silver, and 651,317 pounds of lead, for which the lessees received $90,979. After the lease expired in December the property was worked solely by the San Rafael Development Co. Pledge & Milner, of Luning, were the locators of the San Rafael property, which was sold subject to a lease for one year on part of the ground held by Annett, Platt, and Walker. The ore mined by these lessees was hauled, at a cost of $11 a ton, to Luning, a distance of 42 miles, but later the road to Fallon was opened and proved to be a better highway although 60 miles long.

The ore body in the San Rafael property was first opened by an inclined prospecting shaft which passed through a flat-dipping fault that follows the course of the vein. A level was started 100 feet from the surface, and in a short distance ore was found and mined by the lessees. On the 180-foot level the ore body was 12 feet wide; a stope was opened 150 feet long and 50 feet high. Some copper ore was shipped from the Cold Storage and June claims; one lot of lead ore was milled at the Lodi plant and yielded lead concentrate. At the Four Bits and Granite claims a little gold bullion recovered by amalgamation was shipped to San Francisco, Calif.

Manhattan district.—Fourteen producers in the Manhattan district reported the output of 1,807 tons of ore, yielding $23.604 in gold, 762 ounces of silver, and 123 pounds of lead, valued in all at $24,144, or $13.36 a ton. Eighty-three tons of sulphide antimony ore included in this output were shipped to a lead smelter and contained 47.48 ounces of gold, a little silver and lead, and 36,775 pounds of antimony. The value of the antimony was $1,379, which is not included in the $24,144 shown above. Six operators reported a placer output, largely from drift mining, amounting to $8,187 in gold and 186 ounces of silver. The Gold Nuggett, Crescent, Dexter No. 14,

and other surface mines were worked by lessees. The Durant, Little Grey, Jumbo, Jumping Jack, Big Four, Union No. 9, Midas, April Fool, Manhattan Union, and Nellie Grey mines, operated chiefly by lessees, yielded ore, which was treated by amalgamation in the War Eagle mill. Except for two cars of gold-antimony ore, no ore was produced from the White Caps mine, under development. Arsenic and antimony, which the ore carries to a depth of 900 feet, interfered with cyanidation. Two years ago the company suspended milling and sank an inclined shaft from the 900-foot level to the 1,200-foot level, believing that at greater depth both arsenic and antimony would disappear. Two ore bodies free from arsenic and antimony were opened on the 1,120-foot level; they were 95 and 250 feet long and 3 to 15 feet wide and averaged about $20 a ton in gold. On the 1,220-foot level 200 feet of ore 6 feet in width averaged about $40 a ton in gold. Sinking was resumed to the 1,325-foot level in February, 1926.

Pablo Creek district.—The Valley View claim, 8 miles west of Round Mountain, produced 3 tons of silver-lead ore, which were hauled to Tonopah and shipped to a smelter near Salt Lake City, Utah.

Round Mountain district.—Production of placer gold and the milling of ore from the property of the Round Mountain Mining Co. were continued during 1925. The amalgamation mill treated 6,450 tons of ore, yielding $15.68 to the ton in gold and silver, and the placers produced $38,005 in gold and silver from the hydraulicking of about 60,000 yards of material.

San Antone district (Royston).—From the Golden Eagle property, worked by the Canadian Leasing Co., siliceous silver ore was shipped to the cyanidation plant at Millers and silver-lead ore to a smelter near Salt Lake City, Utah. In all 157 tons of ore were mined which yielded 31.47 ounces of gold, 13,143 ounces of silver, 296 pounds of copper, and 16,262 pounds of lead.

Tonopah district.—Ten producers on the Nye County side of the Tonopah district reported mining 192,679 tons of siliceous ore containing gold and silver; most of it was of milling grade. Dividends paid to stockholders in 1925 by three companies amounted to $943,522.

Mine production of gold and silver in the Tonopah district, Esmeralda and Nye Counties, Nev., in 1925

	Producers	Ore	Gold	Silver	Copper	Lead	Total value
		Short tons		*Fine ounces*	*Pounds*	*Pounds*	
1925	13	197,409	$683,623	3,070,409	----------	----------	$2,814,487
Decrease from 1924	----------	88,298	478,370	1,961,634	----------	----------	1,718,975
Total, 1904–1925	----------	7,636,899	33,220,608	151,620,002	12,113	214,523	135,665,296

The Tonopah Mining Co.[8] operated its mine at Tonopah and its milling plant at Millers without interruption during 1925, treating 54,477 dry tons of ore which yielded 15,423 ounces of gold and 1,210,699 ounces of silver. Most of this ore, 35,204 tons, was purchased ore delivered to the mill for treatment; the remainder, 19,273

[8] Tonopah Mining Co. Ann. Rept. for 1925.

tons, came from the company's mine. The mill recovery was 94.9 per cent of the gold and 91 per cent of the silver. The company did 12,362 feet of development work in drifts, raises, and crosscuts, opening enough ore to keep the mill running several months.

From the Tonopah Extension property [9] 78,347 tons of ore were mined and treated by cyanidation. The ore contained 901,626.84 ounces of silver, or an average of 11.51 ounces to the ton, and 9,037.48 ounces of gold, or an average of 0.115 ounce to the ton. The total amount received from sales of these metals was $811,592, or $10.36 a ton of ore. The cost of mining, including all development, was $9.214 a ton, milling $4.293, and marketing, including refining, express, and freight, $0.212—a total cost of $13.72 a ton. With the metal loss in tailing of $0.54 and the cost of depreciation, etc., amounting to $1.12 a ton, the total cost was $15.38 a ton. The loss per ton of ore was $4.44. The total net loss for the year was $381,382, after deducting for depreciation of plant and equipment but not for depletion. Assuming gold as a by-product, and crediting net costs with value of gold recovered, the cost of producing an ounce of silver was $1.082. Dividend distributions on January 1 and April 1, 1925, amounted to $143,521.63, making a total of $3,927,220.63 since July 1, 1905.

The Belmont mine [10] produced 31,034 dry tons of ore containing 7,194.73 ounces of gold and 679,335 ounces of silver, valued at $616,174. The ore was treated at the Millers plant of the Tonopah Mining Co., averaged 0.232 ounce of gold and 21.89 ounces of silver to the ton, and was valued at $19.855 a ton for both metals. Freight, milling, and metal losses amounted to $6.237 a ton, leaving a net value of $13.618 a ton. The total operating cost per ton of ore was $11.639, leaving a net profit of $1.979 a ton, or a total profit of $61,407.27. Dividends paid to stockholders amounted to $150,000. In all, 237,589 feet, or 45 miles, of development work has been done in the Belmont mine, 9,083 feet of which was done during 1925. The company's annual report to stockholders contains the following paragraphs:

> The 1,500 level exploratory development was discontinued after 2,848 feet of crosscutting had been performed. This work proved conclusively that there is no ore at this depth. From a point 1,200 feet west of the Belmont shaft, north and south crosscuts were driven from the southwest crosscut 1,505, to the north and south boundaries of your property, a distance of 1,254 feet. The whole of this distance was in the Tonopah rhyolite, which is the most unfavorable formation for ore deposition in the district. The north crosscut was continued 909 feet into an adjoining property on which your company held a 10-year lease. The formation was the same as that encountered in your property. The north crosscut 1,517, which is located 300 feet to the east of the Belmont shaft, was driven 340 feet to the north boundary of your property in the andesite and glassy trachyte breccia, both of which proved to be as unfavorable as the Tonopah rhyolite encountered in the other crosscuts.
>
> Owing to the high cost of driving crosscuts for small faulted segments of veins with very erratic values, it was decided to prospect all doubtful commercial veins with prospect drills. This proved to be entirely successful; 13,075 feet of drilling was performed at a cost of $23,099.87, or $1.767 per foot; 3,909.6 tons of ore, having a gross value of $73,491.82, or $18.80 per ton, were mined from ore bodies discovered during drilling operations.

[9] Tonopah Extension Mining Co. Twenty-First Ann. Rept., for year ended Mar. 31, 1926.

[10] Tonopah Belmont Development Co. Ann. Rept. for 1925.

The West End property[11] produced 28,440 tons of milling ore, containing 4,674.63 ounces of gold and 422,072 ounces of silver, valued together at $387,685, or $13.63 a ton. This ore was treated in the company's cyanidation plant, which also treated custom ore. The average mining cost for the year was $5.96 a ton, milling the ore cost $3.91 a ton, tailing losses were 91 cents a ton, marketing bullion 29 cents, ore hauling 20 cents, and current development 91 cents a ton, making a total cost of $12.18 a ton and leaving a total operating profit of $1.45 a ton. About 3,000 of the 7,142 feet of development work done during the year was driven in the claims of the Tonopah "76" and West End Extension companies; about 3,600 tons of ore were milled from these properties. Although some ore of good grade was found, the ore body was spotty like others in the western ground.

Development work was continued at the Midway mine,[12] and during the year 1,492 feet of work was done, consisting chiefly of sinking a winze 266 feet below the 1,600-foot level and driving crosscuts north and south; no commercial ore was opened.

Other producers at Tonopah were the Halifax, Jim Butler, Monarch-Pittsburg, Rescue Eula, and Desert Queen mines.

Troy district (*Nyala*).—A lessee operating the Evans, or Keokuk No. 2 claim, shipped 14 tons of sulphide lead ore to a smelter near Salt Lake City, Utah.

Tybo district.—Oxidized lead ore shipped to a smelter in California and silver ore treated at Tonopah constituted the output of the Dimmick claim, operated by the Tybo Lead Co. The ore was hauled 65 miles to Tonopah for milling or shipment and netted the operators $4,195.

Union district (*Ione*).—The Shamrock mine, opened by a 50-foot shaft and 1,500 feet of drifts, produced 11 tons of silver ore containing a little gold. A 50-ton cyanide plant on the property was not operated.

Willow Creek district.—For years several properties in the Willow Creek district have produced small lots of rich gold ore, which is hauled 90 miles to Tonopah, the shipping point. During 1925 silver-lead ore was shipped from the Rex property and high-grade gold ore from the Auriferous claim; some amalgamation bullion from various properties was sold in San Francisco, Calif.

ORMSBY COUNTY

Carson River district.—Gold bullion was recovered from old tailing from the mills along the Carson River that treated Comstock ores in the early days; it yielded 90.30 ounces of gold and 221 ounces of silver.

Voltaire district (*Eagle and Washoe Valley*).—From the North Carson Hill property one lot of silver ore containing a little copper and lead was sold to an ore buyer.

PERSHING COUNTY

Antelope district.—The Fresno mine produced some sulphide lead ore with one lot of dump ore which was shipped to Salt Lake City,

[11] West End Consolidated Mining Co., Nineteenth Ann. Rept., for 1925.
[12] Tonopah Divide Mining Co. Ann. Rept. for 1925.

Utah. The richer ore averaged about 22 ounces of silver and 40 cents in gold to the ton, 5 per cent of lead, 3.5 per cent of zinc, and 5 per cent of manganese. The mine is opened by a tunnel, 1,200 feet of drifts, and a shaft 84 feet deep. The Antelope district is reached from Jungo on the Western Pacific Railroad or from Humboldt on the Southern Pacific Railroad, the distance being about 17 miles from either station.

Arabia district (*Oreana*).—Six producers shipped small lots of ore aggregating 213 tons, which yielded $1,021 in gold, 4,967 ounces of silver, 240 pounds of copper, and 75,423 pounds of lead, valued in all at $11,064, or $51.94 a ton. About half the ore came from the Electric mine, and other shipments came from the Montezuma, Jasper, and Lead Fraction properties. The ore is oxidized and contains antimony as well as lead and silver; the predominant mineral is bindheimite.

Jersey Valley district.—The Jersey Valley mine, 50 miles south of Battle Mountain, was not active, but lessees shipped 24 tons of oxidized lead ore, probably sorted from old dumps, to a smelter near Salt Lake City, Utah.

Rochester district.—Seven lode producers in the Rochester district reported 8,718 tons of ore and pond sweeps, yielding $34,012 in gold, 60,012 ounces of silver, and 46 pounds of copper, valued in all at $75,667, or $8.68 a ton. In addition to the ore output, two operators of placers reported the recovery of $682 in gold and 6 ounces of silver. The Rochester Silver property, worked chiefly by lessees, yielded silver ore which was treated by cyanidation. The Lincoln mine yielded gold ore, which was treated in a 2-stamp amalgamation mill, with tank for cyanidation, owned by the Great Western Mines Co. One car of low-grade siliceous gold ore from the Josephine property was shipped to Kennett, Calif., and some rich gold ore from the Frances claim was treated by amalgamation.

Rosebud district.—One lot of rich gold ore was shipped from the Golden Juniper group.

Seven Troughs district.—Lessees working various properties shipped small quantities of gold bullion recovered by amalgamation. The Seven Troughs district, formerly a large producer of gold, has yielded little gold in the last five years.

Sierra district (*Dun Glen*, *Central*, *Sunshine*, *Echo*).—Four producers in the Sierra district reported 78 tons of ore, most of which was silver ore from the Tallula group, operated by the Sierra Platada Consolidated Mines (Inc.). The O'Brien, Gem Five, and Twilight groups shipped small lots. Lessees prospected the low-grade veins in the Gem Five property which is opened by a tunnel 120 feet long and 300 feet of drifts.

Spring Valley district.—A little gold bullion from the Honey Bee prospect was shipped to the mint at San Francisco, Calif.

Unionville district (*Buena Vista*).—A little silver bullion cleaned up from a cyanidation plant near Unionville was shipped to California.

STOREY COUNTY

Comstock district.—Twenty-three producers in the Comstock district reported 474,325 tons of ore and old tailings, compared with

547,428 tons in 1924. The mine production of gold increased from $1,108,743 to $1,196,946, but that of silver decreased from 1,616,692 to 1,350,156 ounces. Most of the ore was treated by concentration and cyanidation, and 50 tons of concentrate containing gold, silver, and a little copper were recovered at an amalgamation mill equipped for concentration. The ore of shipping grade amounting to 2,471 tons yielded 1,192.66 ounces of gold and 14,003 ounces of silver. Crude siliceous ore found its best market at Kennett, Calif., where it was used for converter lining at the Mammoth smelter. This first-class ore was largely gold ore from the Consolidated Virginia, Ophir, Comstock Tunnel, and Sierra Nevada properties. Old tailing, amounting to 2,648 tons, was treated chiefly by concentration and partly by cyanidation. Most of the tailing was from the old Butters' dump.

Gold and silver bullion, recovered by amalgamation from 591 tons of ore produced from 9 properties, yielded 774.11 ounces of gold and 651 ounces of silver. Six mining companies treated by cyanidation 468,615 tons of ore and 298 tons of old tailing, producing bullion which yielded 55,728.40 ounces of gold and 1,331,647 ounces of silver. The Comstock Merger and Flowery properties were the largest producers; others were the Silver Hill group, Comstock Home, and Consolidated Virginia mines. The Consolidated Virginia mine operated a 20-ton mill with a Standard concentrator at the C & C shaft, and plans to install another mill underground, probably on the 1,650-foot level.

The 1,500-ton concentration-cyanidation plant of the Comstock Merger Mines (Inc.) ran full time, and about 400,000 tons of gold-silver ore were milled, resulting in the largest production of gold and the second largest production of silver in Nevada. Development work was done at the rate of about 2,000 feet a month, but no reserves were published, though they were previously estimated at 8,500,000 tons in both the Comstock Merger property and the United Comstock group acquired in October, 1924. During the third quarter of 1925 the company reported treating 111,100 tons of ore, which had a gross value of $4.71 a ton, indicating that the mill feed was rather low-grade ore, and that the mill was not running at full capacity. The value of the gold recovered in bullion is close to that of the silver; the ore, a mixture of oxidized and sulphide minerals, yields approximately 0.107 ounce of gold and 3.14 ounces of silver to the ton.

The Flowery Mines Co., working the Berry and Lady Bryan mines and a 100-ton cyanidation plant in Six Mile Canyon, produced and milled 46,000 tons of ore. From this ore bullion was recovered which yielded 9,789.43 ounces of gold and 6,519 ounces of silver, or $4.34 in gold and 0.14 ounce of silver to the ton of ore treated. Operating costs were about $3 a ton and profits about $8,000 a month. The company claims a reserve of 150,000 tons of ore, averaging $5 a ton. Ore is broken for a width of 80 feet in a mineralized zone several hundred feet wide; gold is found in a network of narrow veins in porphyry. Work is done through the Berry tunnel. The ore is broken by the shrinkage and glory-hole methods and is delivered to the mill by an electric haulage system. Near the portal of the Berry tunnel is the Lady Bryan shaft, sunk many years ago, which is reported to be 1,500 feet deep.

WASHOE COUNTY

Leadville district.—The Leadville Mines Co., the only producer of ore in the district, operated until September 3, when its flotation mill was destroyed by fire. Instead of rebuilding the mill the company announced[13] a plan of leasing parts of the mine and shipping the crude ore to custom flotation mills near Salt Lake City, Utah. During the eight months of milling operations lead concentrate was produced at a rate of about 100 tons a month; it averaged 200 ounces of silver to the ton, 31.29 per cent of lead, and 12 to 20 per cent of zinc. The hauling rate on concentrate to Gerlach and freight and smelter charges, including the zinc penalty, amounted to $32.50 a ton. The mine is developed by a 2,000-foot tunnel and a winze 850 feet deep. The ore occurs in limestone and is rich in silver minerals, although the ore bodies are not large.

Peavine district.—Three producers in the Peavine district reported the output of 28 tons of ore, that yielded $107 in gold, 442 ounces of silver, 2,858 pounds of copper, and 433 pounds of lead, valued in all at $858, or $30.64 a ton. A test lot of silver ore was shipped from the Gold Bond mine, and one car of copper ore from the property of the Nixon Nevada Copper Corporation, which is opened to a depth of 300 feet by 4,000 feet of workings.

Washoe district.—Seven tons of lead ore, containing 25 ounces of silver to the ton, 25 per cent of lead, and 12.7 per cent of zinc, were shipped from the Union mine to a lead smelter near San Francisco, Calif., which did not pay for the zinc.

West Comstock district.—Several lots of gold bullion recovered by amalgamation in a small stamp mill were shipped from the Pandora property of the West Comstock Gold Mines Co. The mine was opened by a vertical shaft 262 feet deep and a tunnel 2,800 feet long. The Last Chance claim, worked by a lessee, was a producer of gold ore of milling grade which was treated in a 2-stamp mill.

White Horse district.—Twelve producers in the White Horse district reported 459 tons of ore, yielding $26,419 in gold and 641 ounces of silver, valued together at $26,864, or $58.53 a ton. Most of the output was gold ore treated by amalgamation in a local crushing plant, but 6 tons was shipped for smelting. The Renegade, Grubstake, and Springfield-Nevada mines, worked by lessees, were the chief producers, although the Sunbeam, Renegade Extension, Texas, Nevada No. 2, Buster, Caroline, Isis, and Gold Center claims produced small lots of ore.

WHITE PINE COUNTY

In 1925 the mine production of all metals except lead in White Pine County showed increases over 1924. The output of ore, etc., increased from 3,516,230 to 3,927,320 tons, gold from $670,541 to $735,955, silver from 149,530 to 160,268 fine ounces, copper from 73,290,006 to 78,653,539 pounds, zinc from 19,025 to 225,784 pounds, and the total value of the metal output from $10,555,875 to $12,175,120. The output of lead decreased from 2,286,522 to 1,631,915 pounds. There were 33 producers, 6 more than in 1924.

[13] Nevada Mining Press, Dec. 18, 1925.

Aurum or Silver Mountain district.—The Columbia, Silver Bar, and Nevada Grand properties produced lead ore containing silver. The Silver Bar Mining Co. worked a property in the Shell Creek Range, 6 miles from the Piermont mine. The 150-foot tunnel was continued to cut at depth a vein exposed at the surface. During this development 68 tons of oxidized lead ore containing a little silver were shipped for smelting. The Nevada Grand property yielded oxidized copper ore, and some ore containing zinc was sold to a milling plant near Salt Lake City, Utah. The total output of the district was 216 tons of ore, which yielded metals valued at $9,316, or $43.13 a ton of ore.

Black Horse district.—The Silver Peak claim, 10 miles southwest of Gandy, Utah, produced 26 tons of first-class silver-lead ore.

Cherry Creek district (Egan Canyon).—From the Star property, worked by the Cherry Silver Mining Co., 18 tons of silver ore containing a little gold and lead were shipped to a smelter near Salt Lake City, Utah.

Duck Creek district.—Five producers in the Duck Creek district reported 80 tons of lead ore, which yielded 186 ounces of silver and 83,598 pounds of lead, valued together at $7,402, or $92.53 a ton. All the ore was of shipping grade and was produced from the High Spy, Galena, Ely Amalgamated, Carbonate Lead, and Gisborne properties.

Eagle or Regan district.—From the Dandy group of claims 34 tons of sulphide lead ore containing silver and a little gold were shipped to Salt Lake City, Utah, for smelting.

Granite district (Steptoe).—Lessees at the Cuba mine, 3 miles west of Steptoe, shipped several lots of first-class lead ore containing silver. One small lot of rich gold ore shipped from the Bullfrog mine assayed 4 ounces of gold and 9.5 ounces of silver to the ton and contained a little copper, lead, and zinc.

Osceola district.—The Sun Rise claim yielded a sample lot of ore that was amalgamated, but placers yielded most of the output of gold and silver, which was valued at $395.

Robinson district (Ely).—Six producers in the Robinson district reported 3,922,770 tons of ore; most of it was milling ore from the property of the Nevada Consolidated Copper Co. The mine production of all metals increased in 1925, as shown in the table following:

Mine production of gold, silver, copper, lead, and zinc in the Robinson district, White Pine County, Nev., in 1925

	Producers	Ore	Gold	Silver	Copper	Lead	Zinc	Total value
		Short tons		*Fine ozs.*	*Pounds*	*Pounds*	*Pounds*	
1925	6	3, 922, 770	$734, 064	126, 720	[1] 78, 627, 308	221, 531	207, 226	$12, 022, 108
Increase from 1924	2	417, 408	65, 688	12, 753	5, 348, 244	58, 015	188, 201	1, 663, 500
Total, 1904–1925	-------	48, 879, 747	8, 319, 376	1, 439, 085	1, 084, 311, 084	3, 517, 947	6, 008, 521	200, 229, 593

[1] Includes 476,540 pounds of copper saved from precipitates recovered from mine water largely from leaching of ore in place.

From the Nevada Consolidated property,[14] 3,234,390 dry tons of ore averaging 1.21 per cent of copper were mined and milled. In addition 598,114 dry tons of porphyry sulphide material averaging 0.684 per

[14] Nevada Consolidated Copper Co. Nineteenth Ann. Rept., for 1925.

cent of copper, removed in stripping operations by steam shovel, was concentrated. In all, 73,653,886 pounds of refined copper, 35,123.84 ounces of gold, and 113,168 ounces of silver were recovered, compared with 70,237,050 pounds of copper, 32,151.60 ounces of gold, and 104,994 ounces of silver recovered in 1924. Costs of steam-shovel mining of concentrating ores and of stripping operations, exclusive of depreciation and Federal, State, and local taxes, but including all other overhead expense, were 20.14 cents a ton of ore and 45.02 cents a cubic yard of stripping, compared with 21.42 cents and 47.67 cents, respectively, in 1924. Costs of mining concentrating ores from the underground porphyry area of the Ruth mine, exclusive of charges for prepaid development, depreciation, and all taxes, but including all other overhead expense, were 85.3 cents a ton in 1925, compared with 96.9 cents and $1.097 a ton for 1924 and 1923, respectively. Each 8-hour shift 2,759 tons of ore was mined by steam shovel and 1,128 cubic yards of waste was moved. In underground work on the Ruth group 11.80 dry tons of ore were mined per man shift. The milling cost was 51.1 cents per ton of ore treated and 30.7 tons was milled per man shift. The recovery from ore containing 1.21 per cent of copper was 92.24 per cent, or 22.32 pounds to the ton of ore. The concentrate averaged 10.70 per cent of copper. The total net cost of copper produced was 10.39 cents a pound after the usual credits were applied for gold and silver and miscellaneous earnings. This cost of copper included depreciation of plants and equipment, general overhead expenses, and all taxes except Federal taxes. The following paragraphs are from the company's annual report:

The annual reports for recent years have called attention to the fact that ore-bearing areas and zones were being extended by the campaign of drilling and other development regularly pursued, but no definite figures have been given as to increases in ore so indicated, or reserves remaining, except by subtraction of the tonnage mined each year from the reserve figures given in the report for the previous year.

For the report now issued a complete recalculation of ore reserves remaining unmined as of December 31, 1925, has been made. This recalculation includes new ore occurrences as well as lower grade material between and adjoining previously calculated ore sections, all of which must be mined together. It also includes the dilution factor of all underground tonnage as experienced in these operations in the past. The result of this new basis of calculation is in close accord with diluted grade and correspondingly increased tonnage, as it will actually be mined, and gives an ore reserve remaining on December 31, 1925, of 84,584,114 tons, averaging 1.456 per cent copper. Of this total tonnage approximately 69,000,000 tons are in the Copper Flat area and 15,000,000 tons in the Ruth and Kimbley underground groups.

Sinking of the five-compartment Wedge shaft, which will serve to mine the deep-level pit ores, was begun. The present hoist installation is of 4,000 tons daily capacity, and will be replaced with one of greater capacity within two years, when underground development will have been sufficiently advanced.

Two more ball mills, including concentrating and flotation equipment, were installed, making 24 at the end of the year. There are three bays still available under present superstructure for three additional mills when needed.

All construction work on crushing plant, 72-inch roll additions, as well as new smelter crushing plant, were completed during the year, and all changes were limited to details of better metallurgy and lower costs.

The concentrate belt feeding system referred to in 1924 annual report was completed and operated for seven months of the year. This novel arrangement has given more regular feed control from the 10,000-ton concentrate storage bins to individual roaster feed bins, with substantial cost reductions.

Furnace enlargement has been the tendency during the past few years. In 1925 the No. 3 furnace was built of inside dimensions 34 by 134 feet. Behind

this furnace three 860-horsepower Stirling boilers were placed in parallel. This furnace went into commission in August, and has a normal capacity of 900 tons of concentrates daily.

In 1908 the mill of the Nevada Consolidated was a gravity concentration plant. The present mill uses a combination of tables, fine crushing, and flotation, and has shown a decrease in costs and an increase in recovery. In 1925, when the feed assayed 1.1 per cent of copper, the recovery of copper per ton was equal to that of about 5 or 10 years ago, when the feed assayed 1.5 per cent of copper. The following table is taken from an article[15] by Parsons on the Nevada Consolidated mill.

	1908	1914	1919	1924	1925
Assay of feed, per cent of copper	2.3	1.5	1.6	1.2	1.1
Recovery, per cent	66.0	68.0	70.0	87.0	91.0
Cost of milling, cents per ton			107.5	59.7	
Tons milled per man shift			15.3	28.3	

The Richard and Minnesota mines of the Consolidated Coppermines Corporation[16] produced 48,757 dry tons of ore, most of which was shipped to the plants of the Nevada Consolidated Copper Co. for milling or smelting. The total ore yielded 4,620,072 pounds of copper, 256.11 ounces of gold, and 9,757 ounces of silver. Included in this output was 236,391 pounds of copper, contained in precipitates from ore leached in place in the Morris Brooks mine. Lessees shipped 805 dry tons of ore containing 51.61 ounces of gold, 8,531 ounces of silver, 22,864 pounds of copper, 67,767 pounds of lead, and 203,439 pounds of zinc. All of the lead ore mined by lessees was shipped to a lead smelter in Utah; the zinc ore, with one car of zinc concentrate, was shipped to Amarillo, Tex. The property was worked only seven months in 1925. An excerpt from the company's report follows:

A total of 1,073 feet of exploration and development in the form of drifts, crosscuts, and raises was completed at the Richard mine during the year.

Work in the first shear zone consisted in raising and crosscutting the oxide ore body above the eighth level, which had been outlined by drill holes as reported in the 1924 annual report. The purpose of this work was to more definitely ascertain the grade, shape, and extent of the ore, and with this information it is hoped to be able to develop a cheaper mining system than that usually applied to this character of ore body.

On the eighth level the 803 crosscut was extended to within the vicinity of the third shear zone, where indications were found to be favorable to finding high-grade ore bodies similar in character to those found in the first shear zone.

A total of 22 holes comprising 12,308 feet was drilled on April Fool, Watson, April Fool Fraction, and Mirandi claims, principally devoted to close drilling with favorable results.

Lead ore was produced from two other properties—the Silver Age and Lead King No. 2 mines—and 3 tons of copper ore were shipped from the Copper King claim.

Ward district (Taylor).—Nearly 3,000 tons of lead ore and some copper-lead matte were shipped from the district in 1925. The Ward

[15] Parsons, A. B., "The rejuvenation of Nevada Consolidated": Eng. and Min. Jour. Press, vol. 120, p. 725, 1925.
[16] Consolidated Coppermines Corporation Ann. Rept. for 1925.

mine, worked by several sets of lessees, was the largest producer. The ore was hauled 14 miles to the railroad station and shipped to smelters near Salt Lake City, Utah.

Warm Springs district.—A test lot of gold ore was shipped from the Gold Mountain property, operated by the Bourne Gold Mining Co., to a smelter near Salt Lake City, Utah.

White Pine district (Hamilton).—As a result of considerable development work, 10 lode producers in the White Pine district reported the production of 798 tons of ore which with 470 tons of old tailings yielded $246 in gold, 21,536 ounces of silver, 11,140 pounds of copper, and 567,422 pounds of lead, valued in all at $66,140, or $52.16 a ton of ore and tailings. Of this output 660 tons of ore were shipping grade; 138 tons were milled, producing 46 tons of concentrate. Old tailing treated by cyanidation yielded some silver bullion containing a little gold. The McEllin property, worked by the Hamilton Leasing Association, was the largest producer of lead ore. The Belmont Development & Mining Co. was actively engaged in developing the Nevada and Roosevelt mines, which yielded some first-class lead ore and a little ore that was jigged. Other producers were the Great Valley, Letha, Red Top Extension, and Rocco Homestake mines.

GOLD, SILVER, COPPER, LEAD, AND ZINC PRODUCED IN COLORADO, 1858–1925, BY YEARS, IN TERMS OF RECOVERED METALS[1]

[Compiled by Charles W. Henderson, originally for inclusion in "Mining in Colorado," United States Geological Survey Prof. Paper 138, 1926. Certain figures for the years 1904 to 1913, inclusive, do not agree with figures appearing in Mineral Resources of the United States]

Year	Ore sold or treated (short tons)	Gold			Silver			Copper			Lead			Zinc			Grand total value
		Placer	Lode	Total	Fine ounces	Average value per ounce	Total value	Pounds	Average value per pound	Total value	Pounds	Average value per pound	Total value	Pounds	Average value per pound	Total value	
1858–1867		($14,923,918	$10,097,866	$25,021,784	302,829		$406,139										$25,427,923
1868		320,000	1,690,000	2,010,000	200,716	$1.326	266,150	50,000	$0.23	$11,500							2,287,650
1869		380,000	2,800,000	3,180,000	475,472	1.325	630,000	102,000	.2425	24,735	150,000	$0.06	$9,000				3,843,735
1870		695,000	2,320,000	3,015,000	496,988	1.328	660,000	182,500	.2118	38,654	250,000	.06	15,000				3,728,654
1871		190,000	3,443,951	3,633,951	776,648	1.325	1,029,059	183,000	.2412	44,140	555,000	.06	33,300				4,740,450
1872		271,500	2,374,963	2,646,463	1,524,206	1.322	2,015,000	204,000	.3556	72,542	1,150,000	.064	73,600				4,807,605
1873		285,000	1,733,931	2,018,931	1,543,047	1.297	2,001,331	379,493	.280	106,258	1,236,400	.06	74,184				4,200,704
1874		258,997	1,893,490	2,152,487	2,348,174	1.278	3,000,966	475,541	.220	104,619	1,277,933	.06	76,676				5,334,748
1875		263,260	1,961,308	2,224,568	2,330,291	1.24	2,889,560	280,815	.227	63,745	1,636,000	.058	94,888		$0.07		5,272,761
1876		285,000	2,441,311	2,726,311	2,564,403	1.16	2,974,707	333,333	.21	70,000	1,334,020	.061	81,375		.072		5,852,393
1877		265,000	2,883,708	3,148,708	2,882,121	1.20	3,458,546	493,664	.19	93,796	4,286,364	.055	235,750		.06		6,936,800
1878		275,774	2,964,574	3,240,348	4,672,961	1.15	5,373,904	736,145	.166	89,000	13,722,222	.036	494,000		.049		9,197,252
1879		187,000	3,006,500	3,193,500	11,899,335	1.12	13,327,257	704,301	.186	131,000	47,348,000	.041	1,941,268		.05		18,593,025
1880		179,000	3,073,514	3,252,514	14,397,539	1.15	16,557,170	859,000	.214	183,826	71,348,000	.05	3,567,400		.055		23,560,910
1881		175,500	3,124,500	3,300,000	13,272,188	1.13	14,997,572	884,000	.182	160,888	81,094,000	.048	3,892,512		.052		22,350,972
1882		192,500	3,167,500	3,360,000	12,761,719	1.14	14,548,359	1,494,000	.191	285,354	110,000,000	.049	5,390,000		.053		23,583,713
1883		132,000	3,968,000	4,100,000	13,434,610	1.11	14,912,417	1,152,652	.165	190,188	141,114,000	.043	6,067,902		.045		25,270,507
1884		123,551	4,176,449	4,300,000	12,375,000	1.11	13,736,251	2,013,125	.13	261,706	126,330,000	.037	4,674,209		.044		22,972,166
1885		124,035	4,079,390	4,203,425	12,220,982	1.07	13,076,461	1,146,460	.108	123,818	106,692,000	.039	4,160,989	100,000	.043	$4,300	21,568,983
1886	(2)	163,328	4,286,672	4,450,000	12,375,000	.99	12,251,250	1,146,460	.111	127,257	118,000,000	.046	5,428,000	100,000	.044	4,400	22,260,907
1887		280,933	3,719,067	4,000,000	11,601,563	.98	11,369,534	2,012,027	.138	277,660	126,000,000	.045	5,670,000	100,000	.046	4,600	21,321,794
1888		104,500	3,653,599	3,758,099	14,695,313	.94	13,813,596	1,621,100	.168	272,345	128,404,000	.044	5,649,777	300,000	.049	14,700	23,508,517
1889		135,870	3,747,989	3,883,859	18,375,136	.94	17,272,629	1,170,053	.135	157,956	133,940,000	.039	5,223,660	300,000	.05	15,000	26,553,104
1890		126,380	4,024,752	4,151,132	18,800,000	1.05	19,740,000	3,585,691	.156	559,368	109,192,000	.045	4,913,639	300,000	.055	16,500	29,380,639
1891		125,663	4,474,337	4,600,000	21,160,000	.99	20,948,401	6,336,878	.128	811,121	126,256,000	.043	5,429,009	300,000	.05	15,000	31,803,531
1892		71,900	5,228,100	5,300,000	24,000,000	.87	20,880,000	7,503,674	.116	880,866	120,000,000	.04	4,800,001	1,125,000	.046	51,750	31,912,617
1893		98,216	7,428,784	7,527,000	25,838,600	.78	20,154,107	7,695,826	.108	831,149	110,000,000	.037	4,070,000	1,650,000	.04	66,000	32,648,256
1894		108,747	9,382,767	9,491,514	23,281,398	.63	14,667,281	6,481,413	.095	615,734	101,226,000	.033	3,340,458	1,500,000	.035	52,500	28,167,887
1895		95,499	13,209,601	13,305,100	23,398,500	.65	15,209,024	6,079,243	.107	650,479	93,968,000	.032	3,006,976	1,671,000	.036	60,156	32,231,735
1896		90,419	14,820,581	14,911,000	22,573,000	.68	15,349,642	6,022,176	.108	650,395	89,606,000	.03	2,688,178	1,292,000	.039	50,388	33,649,603
1897		130,646	19,448,787	19,579,433	21,278,202	.60	12,766,919	9,149,967	.12	1,097,995	80,794,286	.036	2,908,592	2,683,989	.041	110,044	36,462,983
1898		83,428	23,451,104	23,534,532	23,502,601	.59	13,866,532	10,870,701	.124	1,347,965	113,416,138	.038	4,309,813	3,900,656	.046	179,430	43,248,272
1899		73,589	26,435,086	26,508,675	23,114,688	.60	13,868,811	7,356,970	.171	1,258,041	138,048,446	.045	6,212,178	11,300,656	.058	655,438	48,503,143
1900		77,966	28,684,070	28,762,036	20,336,512	.62	12,608,637	7,826,815	.166	1,299,251	164,274,762	.044	7,228,090	16,282,055	.044	716,410	50,614,424
1901		87,324	27,592,119	27,679,443	18,492,563	.60	11,095,538	7,872,529	.167	1,314,712	148,111,020	.043	6,368,772	26,843,731	.041	1,100,593	47,559,058
1902		118,774	28,398,140	28,516,914	15,941,523	.53	8,449,008	8,463,938	.122	1,132,601	106,296,827	.041	4,358,169	52,582,510	.048	2,523,963	44,980,655
1903		129,049	21,476,308	21,605,357	13,245,438	.54	7,152,536	7,809,920	.137	1,069,958	101,513,414	.042	4,263,566	80,616,000	.054	4,353,263	38,444,680
1904	2,333,881	193,068	24,049,417	24,242,485	12,960,792	.58	7,517,260	9,412,707	.128	1,204,828	107,498,854	.043	4,622,453	66,771,590	.051	3,405,353	40,992,379
1905	2,504,087	99,984	25,195,238	25,295,222	12,339,435	.61	7,527,056	9,661,546	.156	1,507,201	115,746,777	.047	5,440,098	83,561,396	.059	4,930,123	44,699,700
1906	2,648,923	106,019	22,799,652	22,905,671	12,330,052	.68	8,390,553	6,618,332	.193	1,277,338	106,646,506	.057	6,078,850	86,012,903	.061	5,246,787	43,899,199
1907	2,383,128	97,219	20,210,429	20,307,648	11,599,514	.66	7,655,679	8,826,254	.20	1,765,251	89,065,232	.053	4,720,457	85,048,564	.059	5,017,865	39,466,900
1908	2,242,969	184,457	22,411,114	22,595,571	9,002,316	.53	4,771,227	10,201,123	.132	1,346,547	61,645,671	.042	2,589,118	30,130,002	.047	1,416,110	32,718,573
1909	2,219,644	457,085	21,526,923	21,984,008	8,904,701	.52	4,630,444	10,916,191	.13	1,419,105	72,162,326	.043	3,102,980	51,210,260	.054	2,765,354	33,901,891
1910	2,434,664	389,828	20,115,786	20,505,614	8,508,942	.54	4,594,829	8,359,307	.127	1,061,632	76,058,775	.044	3,346,586	77,089,648	.051	4,162,841	33,671,502
1911	2,377,936	319,038	18,682,937	19,001,975	7,330,168	.53	3,884,989	8,024,488	.125	1,003,061	69,679,289	.045	3,135,568	94,607,456	.057	5,392,625	32,418,218
1912	2,576,626	423,865	18,164,697	18,588,562	8,212,070	.615	5,050,423	7,107,303	.165	1,172,705	75,242,267	.045	3,385,902	132,222,812	.069	9,124,374	37,340,966
1913	2,734,866	408,007	17,738,909	18,146,916	9,325,255	.604	5,632,454	7,227,826	.155	1,120,313	87,897,773	.044	3,867,502	119,546,129	.056	6,683,400	35,450,585
1914	2,677,526	642,360	19,240,745	19,883,105	8,790,005	.553	4,864,224	6,639,173	.133	883,010	74,211,898	.039	2,891,264	96,774,960	.051	4,945,523	33,469,126
1915	2,737,020	693,310	21,721,634	22,414,944	7,027,972	.507	3,563,182	7,112,537	.175	1,244,694	68,810,597	.047	3,234,098	101,594,994	.124	12,909,779	43,426,097
1916	2,697,333	712,924	18,440,897	19,153,821	7,656,544	.658	5,038,006	8,624,081	.246	2,121,524	70,914,087	.069	4,893,072	134,285,463	.134	17,994,252	49,200,675
1917	2,688,706	661,028	15,068,196	15,729,224	7,304,353	.824	6,018,787	8,122,004	.273	2,217,307	67,990,012	.086	5,847,141	120,315,775	.102	12,272,209	42,084,668
1918	2,314,890	526,202	12,225,516	12,751,718	7,063,554	1.00	7,063,554	6,277,332	.247	1,550,501	65,960,760	.071	4,683,214	89,153,901	.091	8,111,185	34,160,172
1919	1,919,768	550,562	9,336,065	9,886,627	5,758,010	1.12	6,448,971	3,560,207	.186	662,198	37,070,241	.053	1,964,722	37,220,493	.073	2,717,096	21,679,614
1920	1,571,293	514,588	7,061,731	7,576,319	5,409,335	1.09	5,896,175	4,043,734	.184	744,047	46,629,788	.08	3,730,383	48,750,742	.081	3,952,050	21,895,974
1921	1,281,381	344,640	6,490,688	6,835,328	5,631,657	1.00	5,631,657	4,153,442	.129	535,794	19,660,466	.045	884,721	2,360,000	.05	118,000	14,005,500
1922	1,412,100	356,403	6,017,016	6,373,419	5,855,911	1.00	5,855,911	3,373,454	.135	455,416	23,477,200	.055	1,291,246	23,278,000	.057	1,325,706	15,301,698
1923	1,569,100	364,429	6,227,200	6,591,629	5,334,488	.82	4,374,280	4,248,109	.147	624,472	45,698,185	.070	3,198,873	54,152,000	.068	3,682,336	18,471,590
1924	1,514,182	418,506	8,174,610	8,593,116	3,254,370	.67	2,180,428	2,713,219	.131	355,432	47,557,061	.08	3,804,565	56,727,000	.065	3,687,255	18,620,796
1925	1,745,674	150,318	7,076,704	7,227,022	4,506,940	.694	3,127,816	2,360,500	.142	335,191	62,966,000	.087	5,478,042	61,621,000	.076	4,683,196	20,851,267
Grand total 1858–1925	(2)	30,243,106	658,638,922	688,882,028	636,610,710		507,042,189	268,152,279		41,018,189	4,311,160,597		198,944,786	1,858,182,985		134,586,854	1,570,474,046

[1] From 1858 to 1895 the figures for gold and silver represent chiefly United States Mint estimates of recovered metals; figures for copper, lead, and zinc, as far as possible, represent refined metals (some of them estimates from assay content of ores treated, with allowance made for losses). The figures for 1896 to 1905 differ only in that they are based on actual receipts at the mints and smelters. The figures for 1906 to 1925 also represent actual receipts at mints and smelters, supplemented by reports from mining companies. For ore and concentrates to smelters the figures represent assay content of gold and silver but allow for losses of the base metals in treatment.

[2] Figures not available.

GOLD, SILVER, COPPER, L[illegible]OF RECOVERED METALS[1]

[Compiled by Charles W. Henderson, originally[illegible]13, inclusive, do not agree with figures appear-

Year	Ore sold or treated (short tons)	Plac	Zinc			Grand total value
			Pounds	Average value per pound	Total value	
1858–1867		$14,92				$25, 427, 923
1868		320,				2, 287, 650
1869		380,				3, 843, 735
1870		695,				3, 728, 654
1871		190,				4, 740, 450
1872		271,				4, 807, 605
1873		285,				4, 200, 704
1874		258,				5, 334, 748
1875		263,		$0. 07		5, 272, 761
1876		285,				5, 852, 393
1877		265,		. 072		6, 936, 800
1878		275,		. 06		9, 197, 252
1879		187,		. 049		18, 593, 025
1880		179,		. 05		23, 560, 910
1881		175,		. 055		22, 350, 972
1882		192,		. 052		23, 583, 713
1883		132,		. 053		25, 270, 507
1884		123,		. 045		22, 972, 166
1885		124,	100, 000	. 044	$4, 300	21, 568, 983
1886	[2]	163,	100, 000	. 043	4, 400	22, 260, 907
1887		280,	100, 000	. 044	4, 600	21, 321, 794
1888		104,	300, 000	. 046	14, 700	23, 508, 517
1889		135,	300, 000	. 049	15, 000	26, 553, 104
1890		126,	300, 000	. 05	16, 500	29, 380, 639
1891		125,	300, 000	. 055	15, 000	31, 803, 531
1892		71,	1, 125, 000	. 05	51, 750	31, 912, 617
1893		98,	1, 650, 000	. 046	66, 000	32, 648, 256
1894		108,	1, 500, 000	. 04	52, 500	28, 167, 487
1895		95,	1, 671, 000	. 035	60, 156	32, 231, 735
1896		90,	1, 292, 000	. 036	50, 388	33, 649, 603
1897		130,	2, 683, 989	. 039	110, 044	36, 462, 983
1898		83,	3, 900, 656	. 041	179, 430	43, 238, 272
1899		73,	11, 300, 656	. 046	655, 438	48, 503, 143
1900		77,	16, 282, 055	. 058	716, 410	50, 614, 424
1901		87,	26, 843, 731	. 044	1, 100, 593	47, 559, 058
1902		118,	52, 582, 510	. 041	2, 523, 963	44, 980, 655
1903		129,	80, 616, 000	. 048	4, 353, 263	38, 444, 680
1904	2, 333, 881	193,	66, 771, 590	. 054	3, 405, 353	40, 992, 379
1905	2, 504, 087	99,	83, 561, 396	. 051	4, 930, 123	44, 699, 700
1906	2, 648, 923	106,	86, 012, 903	. 059	5, 246, 787	43, 899, 199
1907	2, 383, 128	97,	85, 048, 564	. 061	5, 017, 865	39, 466, 900
1908	2, 242, 969	184,	30, 130, 002	. 059	1, 416, 110	32, 718, 573
1909	2, 219, 644	457,	51, 210. 260	. 047	2, 765, 354	33, 901, 891
1910	2, 434, 664	389,	77, 089, 648	. 054	4, 162, 841	33, 671, 502
1911	2, 377, 936	319,	94, 607, 456	. 054	5, 392, 625	32, 418, 218
1912	2, 576, 626	423,	132, 222, 812	. 057	9, 123, 374	37, 320, 966
1913	2, 734, 866	408,	119, 546, 429	. 069	6, 683, 400	35, 450, 585
1914	2, 677, 526	642,	96, 774, 960	. 056	4, 935, 523	33, 460, 126
1915	2, 737, 020	693,	104, 594, 994	. 051	12, 969, 779	43, 426, 697
1916	2, 697, 333	712,	134, 285, 463	. 124	17, 994, 252	49, 200, 675
1917	2, 688, 706	661,	120, 315, 775	. 134	12, 272, 209	42, 084, 668
1918	2, 314, 890	526,	89, 133, 901	. 102	8, 111, 185	34, 160, 172
1919	1, 919, 768	550,	37, 220, 493	. 091	2, 717, 096	21, 679, 614
1920	1, 571, 293	514,	48, 790, 742	. 073	3, 952, 050	21, 898, 974
1921	1, 281, 381	344,	2, 360, 000	. 081	118, 000	14, 005, 500
1922	1, 412, 100	356,	23, 258, 000	. 05	1, 325, 706	15, 301, 698
1923	1, 569, 100	364,	54, 152, 000	. 057	3, 682, 336	18, 471, 590
1924	1, 514, 182	418,	56, 727, 000	. 068	3, 687, 255	18, 620, 796
1925	1, 745, 674	150,	61, 621, 000	. 065	4, 683, 196	20, 851, 267
Grand total 1858–1925	[2]	30, 243,	858, 182, 985	. 076	134, 586, 854	1, 570, 474, 046

[1] From 1858 to 1895 the figures for gold and[illegible]t refined metals (some of them estimates from assay content of ores treated, with allowance m[illegible]res for 1906 to 1925 also represent actual receipts at mints and smelters, supplemented by repor[illegible]osses of the base metals in treatment.

[2] Figures not available.

GOLD, SILVER, COPPER, LEAD, AND ZINC IN COLORADO

(MINE REPORT)

By Charles W. Henderson

PRODUCTION

SUMMARY

The total calculated gross value of the recovered and estimated recoverable gold, silver, copper, lead, and zinc from gravels treated and ores mined in Colorado in 1925 showed a gain of 12 per cent over the gross value in 1924. Appreciable increases over 1924 in silver and lead and a smaller increase in zinc more than counterbalanced the decreases in gold and copper.

Mine production of gold, silver, copper, lead, and zinc in Colorado, 1924–25

Year	Number of producing mines	Ore	Gold		Silver [1]	Copper	Lead	Zinc	Total value
			Placer	Lode					
		Short tons			*Fine ounces*	*Pounds*	*Pounds*	*Pounds*	
1924	358	1,514,182	$418,506	$8,174,610	3,254,370	2,713,219	47,557,061	56,727,000	$18,620,796
1925	442	1,745,674	150,318	7,076,704	4,506,940	2,360,500	62,966,000	61,621,000	20,851,267
Increase or decrease from 1924	+84	+231,492	−268,188	−1,097,906	+1,252,570	−352,719	+15,408,939	+4,894,000	+2,230,471

[1] Includes placer production as follows: 1924, 4,954 ounces; 1925, 1,899 ounces.

HISTORICAL RECORD

The total recorded value of gold, silver, copper, lead, and zinc produced from Colorado ores and gravels from 1858 to 1925, inclusive, is $1,570,474,046. The items, by years, for each metal entering into this total are given in the accompanying table.

ORE

In 1925 amalgamating and cyaniding mills with concentrating equipment treated 898,488 tons of ore, from which were recovered in bullion and cyanide precipitates 252,601.70 fine ounces of gold, 46,451 fine ounces of silver, and 33,029 tons of concentrates. These concentrates yielded 43,759.07 fine ounces of gold, 826,577 fine ounces of silver, 122,100 pounds of copper, 7,017,700 pounds of lead, and 16,000 pounds of zinc. The average recovery per ton of ore

treated was 0.330 ounce of gold and 0.972 ounce of silver. A total of 623,620 tons of ore went directly to concentrating mills and yielded 131,270 tons of concentrates, or at a ratio of 4.75 to 1. From these concentrates were recovered 26,752.97 fine ounces of gold, 1,413,301 fine ounces of silver, 1,742,980 pounds of copper, 36,310,175 pounds of lead, and 52,785,000 pounds of zinc. The lead concentrates, amounting to 64,506 tons, yielded 32,407,675 pounds of lead; 56,052 tons in 1924 yielded 25,994,555 pounds. The concentrates of all other classes yielded 1,767,900 pounds of lead. The smelting ores yielded 19,638,125 pounds of lead, as compared with 16,383,750 pounds in 1924 and 12,920,976 pounds in 1923.

GOLD

The mine production of gold in 1925 was 349,607.20 fine ounces, valued at $7,227,022, a decrease of 66,084.78 fine ounces and of $1,366,094 from 1924.

The Cripple Creek district contributed $4,608,604, or 64 per cent, of this total yield. That part of the San Juan region including Dolores, La Plata, Ouray, San Juan, and San Miguel Counties yielded $1,765,782, a decrease of $310,116. There were increases of $53,079 in Gilpin County, $31,888 in Boulder, $31,076 in Clear Creek, $3,517 in Hinsdale, $1,696 in Saguache, and $1,571 in Dolores, and decreases of $536,169 in Lake County. $333,301 in Teller, $220,233 in San Miguel, $188,811 in Summit, $92,363 in San Juan, $86,495 in Park, $18,815 in Eagle, $7,878 in Chaffee, $3,572 in Gunnison, and $3,033 in Custer.

The output of placer gold in 1925 was $150,318, a decrease of $268,188. Summit County, with 2 dredges, 3 sluice mines, and 3 hydraulic mines, produced nearly 58 per cent of the placer gold, and Lake County produced 24 per cent and Park County 16 per cent. Other counties producing placer gold in 1925 were Adams, Arapahoe, Chaffee, Clear Creek, Douglas, Eagle, Gilpin, Gunnison, Moffat, and Montrose.

SILVER

The mine production of silver in 1925 was valued at $3,127,816, an increase of $947,388 from 1924. The greatest increases in production were made in Mineral, Lake, Pitkin, Clear Creek, San Juan, and San Miguel Counties. The largest decreases were in Ouray, Eagle, Gunnison, and Custer Counties.

COPPER

The mine production of copper in 1925 was valued at $335,191, a decrease of $20,241 from 1924. San Juan County produced 63.6 per cent of the copper output, San Miguel 9 per cent, Ouray 8.4 per cent, and Lake 7 per cent.

LEAD

The production of lead, reckoned as lead in lead bullion and in leaded zinc oxide, was valued at $5,478,042 in 1925, an increase of $1,673,477 from 1924. There were increases in value in all the important lead-producing counties. San Juan County was the first in rank and was followed in order by Lake, San Miguel, Eagle, Pitkin, Summit, and Dolores.

ZINC

The zinc-bearing ores marketed contained recoverable zinc valued at $4,683,196 in 1925, an increase of $995,941 from 1924. Eagle County produced 22,700,000 pounds, or 37 per cent of the zinc output of the State. San Juan County ranked second and produced 22,200,000 pounds, or 36 per cent of the total in 1925, as against 31 per cent in 1924. Other of the larger producing counties, in order of output in 1925, were Lake, Summit, Dolores, Saguache, Gunnison, Pitkin, and Clear Creek.

Zinc and lead-zinc ores and concentrates as sold at the mine in Colorado in 1925 to custom milling plants, zinc retort furnaces, and zinc oxide plants

Classification	County	Short tons	Estimated recoverable zinc	Zinc content	Average assay of zinc	Average wet assay of lead
			Pounds	*Pounds*	*Per cent*	*Per cent*
Zinc-lead sulphide ore and concentrates.	Lake and Gunnison	16,850	4,877,000	6,782,202	20.13	10.42
Zinc oxidized ore	Lake	11,782	3,823,000	4,774,417	20.26	
Zinc-lead concentrates	Clear Creek and Gilpin	450	255,000	325,302	36.14	4.70
Zinc-lead ore and concentrates.	Eagle, Park, Pitkin, and Summit.	91,209	26,542,000	34,529,382	18.93	6.44
Do	Dolores, Hinsdale, Mineral, Ouray, Saguache, San Juan, and San Miguel.	42,588	26,124,000	35,311,074	41.46	9.35
		162,879	61,621,000	81,722,377	25.09	

OUTPUT OF ORE AND RECOVERED METAL CONTENT

Ore and metals produced in Colorado in 1925, by sources

Source	Ore		Gold		Silver	
	Short tons	Per cent	Fine ounces	Per cent	Fine ounces	Per cent
Dry gold ore	515,849	29.55	248,900.39	71.19	59,345	1.32
Dry gold and silver ore	446,361	25.57	71,240.41	20.38	929,072	20.61
Dry silver ore	224,844	12.88	1,398.10	.40	1,840,621	40.84
	1,187,054	68.00	321,538.90	91.97	2,829,038	62.77
Copper ore	2,193	.13	1,936.51	.55	53,902	1.20
Copper-lead ore	1,417	.08	98.85	.03	30,373	.68
Lead ore	95,113	5.45	2,616.01	.75	527,478	11.70
Lead-zinc ore	448,096	25.67	16,144.16	4.62	1,064,199	23.61
Zinc ore	11,801	.67	1.14		51	
	558,620	32.00	20,796.67	5.95	1,676,003	37.19
Total lode mines	1,745,674	100.00	342,335.57	97.92	4,505,041	99.96
Total placers			7,271.63	2.08	1,899	.04
Total lode mines and placers, 1925	1,745,674	100.00	349,607.20	100.00	4,506,940	100.00
Total lode mines and placers, 1924	1,514,182		415,691.98		3,254,370	
Increase or decrease from 1924	+231,492		−66,084.78		+1,252,570	

Ore and metals produced in Colorado in 1925, by sources—Continued

Source	Copper		Lead		Zinc	
	Pounds	Per cent	Pounds	Per cent	Pounds	Per cent
Dry gold ore	39,830	1.69	187,060	0.30	16,000	0.03
Dry gold and silver ore	158,200	6.70	7,302,300	11.60		
Dry silver ore	121,780	5.16	9,640,965	15.31		
	319,810	13.55	17,130,325	27.21	16,000	.03
Copper ore	286,410	12.13	59,100	.09		
Copper-lead ore	77,500	3.28	265,800	.42		
Lead ore	49,480	2.10	11,283,375	17.92		
Lead-zinc ore	1,627,300	68.94	34,226,400	54.36	57,777,000	93.76
Zinc ore			1,000		3,828,000	6.21
	2,040,690	86.45	45,835,675	72.79	61,605,000	99.97
Total lode mines, 1925	2,360,500	100.00	62,966,000	100.00	61,621,000	100.00
Total lode mines, 1924	2,713,219		47,557,061		56,727,000	
Increase or decrease from 1924	−352,719		+15,408,939		+4,894,000	

Placer output in Colorado in 1925, in fine ounces

County	Sluicing and hydraulic		Dredging		Total	
	Gold	Silver	Gold	Silver	Gold	Silver
Adams	88.82	13			88.82	13
Arapahoe	2.22				2.22	
Chaffee	11.66	1			11.66	1
Clear Creek	9.05	2			9.05	2
Douglas	4.69				4.69	
Eagle	1.66				1.66	
Gilpin	31.20	7			31.20	7
Gunnison	1.69				1.69	
Lake	3.55	1	1,750.53	547	1,754.08	548
Moffat	3.29				3.29	
Montrose	28.59	7			28.59	7
Park	24.75	5	1,120.38	251	1,145.13	256
Summit	234.60	65	3,954.95	1,000	4,189.55	1,065
	445.77	101	6,825.86	1,798	7,271.63	1,899
Total, 1924	310.85	81	19,934.38	4,873	20,245.23	4,954
Increase or decrease from 1924	+134.92	+20	−13,108.52	−3,075	−12,973.60	−3,055

Ores sold or treated in Colorado in 1925, with content in terms of recovered metals

DRY GOLD ORE

County	Ore	Gold	Silver	Copper	Lead	Zinc
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*
Boulder	540	981.70	1,156			
Clear Creek	7,825	1,729.30	4,878	5,340	32,060	16,000
Eagle	80	112.50	542	3,400	500	
Gilpin	8,918	4,113.47	5,803	23,190	44,300	
Gunnison	306	513.13	1,636		9,900	
Lake	34,304	15,897.05	11,678	6,500	54,600	
La Plata	70	139.90	853		600	
Ouray	76	424.84	660	1,200	600	
Park	931	1,354.31	832	200	37,000	
Rio Grande	188	169.80	512		4,500	
San Juan	13	52.80	25			
San Miguel	97	248.37	968		500	
Summit	44	222.00	119		2,500	
Teller	462,457	222,941.22	29,683			
	515,849	248,900.39	59,345	39,830	187,060	16,000
Total, 1924	513,083	288,738.98	86,844	55,190	138,884	
Increase or decrease from 1924	+2,766	−39,838.59	−27,499	−15,360	+48,176	+16,000

Ores sold or treated in Colorado in 1925, with content in terms of recovered metals—Continued

DRY GOLD AND SILVER ORE

County	Ore	Gold	Silver	Copper	Lead	Zinc
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*
Boulder	11,202	1,614.55	31,044		92,800	
Clear Creek	1,418	238.90	6,968	8,200	51,900	
Dolores	7	13.20	719			
Eagle	29	29.44	912			
Gilpin	163	15.67	304		13,200	
Lake	1,068	477.70	13,021	27,000	61,300	
La Plata	710	1,017.00	18,284		200	
Ouray	230	14.60	732		22,000	
San Miguel	424,346	67,604.75	846,674	123,000	6,989,000	
Summit	7,188	214.60	10,414		71,900	
	446,361	71,240.41	929,072	158,200	7,302,300	
Total, 1924	435,876	78,811.00	936,118	525,702	7,206,007	278,000
Increase or decrease from 1924	+10,485	−7,570.59	−7,046	−367,502	+96,293	−278,000

DRY SILVER ORE

Boulder	38	26.90	3,877		1,300	
Chaffee	31	2.50	1,841			
Clear Creek	21,653	25.12	142,571	280	166,165	
Custer	101	7.40	1,437			
Eagle	1,670	100.19	17,488	10,600	3,500	
Gilpin	55	5.39	2,544		7,500	
Hinsdale	39	3.90	1,993		600	
Lake	124,707	841.20	636,403	31,000	6,327,700	
La Plata	125	7.68	3,694		1,200	
Mineral	7,980	41.00	738,022		490,400	
Ouray	44	.65	1,925	500	1,300	
Pitkin	36,565		157,529		1,335,300	
Saguache	55	9.60	2,090	800	200	
San Juan	140	1.32	581	6,000	3,000	
San Miguel	31,556	322.85	123,513	72,600	1,297,400	
Summit	80	2.40	5,113		5,400	
	224,844	1,398.10	1,840,621	121,780	9,640,965	
Total, 1924	125,917	1,966.08	956,420	401,365	5,630,165	
Increase or decrease from 1924	+98,927	−567.98	+884,201	−279,585	+4,010,800	

COPPER ORE

Clear Creek	250	824.89	3,749	17,000		
Gilpin	76	221.98	543	5,410		
Gunnison	8		2	7,000		
Hinsdale	44	6.70	2,332	2,300		
Lake	1,160	767.20	35,813	99,300	48,900	
Ouray	529	52.95	3,913	147,000	3,000	
Park	55	50.39	5,973	3,800	3,200	
Saguache	12	6.00	5	700		
San Juan	59	6.40	1,572	3,900	4,000	
	2,193	1,936.51	53,902	286,410	59,100	
Total, 1924	1,803	2,136.19	24,666	119,315	24,219	
Increase or decrease from 1924	+390	−199.68	+29,236	+167,095	+34,881	

COPPER-LEAD ORE

Hinsdale	1,007	45.50	17,870	18,500	177,800	
Ouray	219	25.65	2,158	41,000	25,500	
Park	123	5.70	8,109	14,000	36,000	
San Juan	68	22.00	2,236	4,000	26,500	
	1,417	98.85	30,373	77,500	265,800	
Total, 1924	425	303.50	21,540	41,498	104,456	
Increase or decrease from 1924	+992	−204.65	+8,833	+36,002	+161,344	

Ores sold or treated in Colorado in 1925, with content in terms of recovered metals—Continued

LEAD ORE

County	Ore	Gold	Silver	Copper	Lead	Zinc
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*
Boulder	74	16.48	5,355		29,100	
Chaffee	111	19.41	1,244	2,000	37,600	
Clear Creek	342	194.06	12,753	4,180	150,075	
Custer	44,694	5.32	6,638		1,343,700	
Dolores	60		399	500	28,800	
Eagle	2	.20	25		1,500	
Gilpin	278	77.70	8,187	400	112,200	
Grand	7	.14	774		800	
Gunnison	539	22.45	7,086	3,000	259,600	
Hinsdale	343	87.18	3,086	1,200	172,300	
Lake	32,001	1,712.40	163,122	7,200	5,812,500	
Mineral	27	1.81	713		3,600	
Ouray	522	106.39	25,518	2,500	264,000	
Park	3	.40	473		300	
Pitkin	13,898		143,049		1,818,700	
Saguache	70	14.80	642		21,400	
San Juan	608	119.80	37,485	11,100	332,500	
San Miguel	1,071	203.97	102,650	17,400	627,900	
Summit	463	33.50	8,279		266,800	
	95,113	2,616.01	527,478	49,480	11,283,375	
Total, 1924	67,979	3,586.75	379,635	38,441	9,023,359	
Increase or decrease from 1924	+27,134	−970.74	+147,843	+11,039	+2,260,016	

LEAD-ZINC ORE

Clear Creek	7,524	62.30	23,882	1,000	337,600	229,000
Dolores	8,221	83.11	37,595	46,500	1,787,000	2,106,000
Eagle	85,263	307.50	64,068		4,076,000	22,700,000
Gilpin	800	54.65	1,285		20,300	10,000
Gunnison	4,107	45.35	18,511	5,000	967,000	1,240,000
Hinsdale	172	53.56	1,885	1,000	24,000	45,000
Lake	12,743	28.15	31,550		1,583,000	3,637,000
Mineral	40				7,000	8,000
Ouray	428	50.35	1,028	6,800	65,600	83,000
Park	11		14		1,000	2,000
Pitkin	2,222		8,635		485,500	905,000
Saguache	27,000	64.55	60,248		1,247,000	1,577,000
San Juan	273,895	14,886.81	766,355	1,477,000	20,468,000	22,200,000
San Miguel	331	14.32	1,750	7,000	90,400	100,000
Summit	25,339	493.51	47,393	83,000	3,067,000	2,935,000
	448,096	16,144.16	1,064,199	1,627,300	34,226,400	57,777,000
Total, 1924	350,153	19,877.46	842,341	1,531,708	25,419,677	50,608,000
Increase or decrease from 1924	+97,943	−3,733.30	+221,858	+95,592	+8,806,723	+7,169,000

ZINC ORE

Lake	11,782					3,823,000
Saguache	19	1.14	51		1,000	5,000
	11,801	1.14	51		1,000	3,828,000
Total, 1924	18,946	26.79	1,852		10,294	5,841,000
Decrease from 1924	7,145	25.65	1,801		9,294	2,013,000

Mine production of metals from gold and silver mills in Colorado in 1925

County	Ore to gold and silver mills	Recovered in bullion		Concentrates and recovered metal content					
		Gold	Silver	Concentrates	Gold	Silver	Copper	Lead	Zinc
	Short tons	*Fine ounces*	*Fine ounces*	*Short tons*	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*
Boulder	471	732.06	28	5	69.67	43			
Clear Creek	5,919	416.74	133	253	548.28	1,303	800	23,700	16,000
Gilpin	7,332	2,018.95	683	127	170.75	1,088	1,300	42,500	
Gunnison	100	43.48	27						
Lake		1,417.35	112						
Ouray		200.74	100						
Park	466	25.81	18	22	89.40	87		5,000	
San Miguel	421,743	24,805.35	15,667	32,622	42,880.97	824,056	120,000	6,946,500	
Teller	462,457	222,941.22	29,683	(1)	(1)	(1)			
	898,488	252,601.70	46,451	33,029	43,759.07	826,577	122,100	7,017,700	16,000
Total, 1924	867,367	277,350.83	50,740	28,607	44,451.11	831,044	171,814	6,007,019	
Increase or decrease from 1924	+31,121	−24,749.13	−4,289	+4,422	−692.04	−4,467	−49,714	+1,010,681	+16,000

[1] Concentrates produced were cyanided and contents are included in bullion recovered.

Mine production of metals from concentrating mills in Colorado in 1925

County	Ore to concentrating mills	Concentrates and recovered metal content					
		Concentrates produced	Gold	Silver	Copper	Lead	Zinc
	Short tons	*Short tons*	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*
Boulder	11,200	356	1,608.26	30,886		92,800	
Clear Creek	31,796	1,955	703.39	135,586	11,620	529,775	229,000
Custer	44,433	1,000				1,260,000	
Dolores	8,221	4,099	83.11	37,595	46,500	1,787,000	2,106,000
Eagle	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Gilpin	1,920	604	773.29	3,159	5,560	35,600	10,000
Gunnison	2,921	1,387	45.35	10,480	5,000	620,000	748,000
Hinsdale	1,172	330	97.76	19,490	19,000	199,000	45,000
Lake	33,000	7,067	6,881.00	2,429			
Ouray	658	180	64.95	1,760	6,800	87,600	83,000
Pitkin	34,911	6,676		92,222		1,337,500	52,000
Rio Grande	180	20	121.80	477		4,500	
Saguache	27,000	3,628	64.55	60,248		1,247,000	1,577,000
San Juan	274,035	50,616	14,888.13	766,936	1,483,000	20,471,000	22,200,000
San Miguel	34,571	3,542	502.47	132,916	82,500	1,430,400	100,000
Summit and Eagle	117,602	49,810	918.91	119,117	83,000	7,208,000	25,635,000
	623,620	131,270	26,752.97	1,413,301	1,742,980	36,310,175	52,785,000
Total, 1924	462,361	102,133	34,450.97	1,013,550	1,920,911	25,166,292	43,370,000
Increase or decrease from 1924	+161,259	+29,137	−7,698.00	+399,751	−177,931	+11,143,883	+9,415,000

[1] Included with Summit County.

Mine production of metals from Colorado concentrates in 1925

BY COUNTIES

	Concentrates	Recovered metal content				
		Gold	Silver	Copper	Lead	Zinc
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*
Boulder	361	1,677.93	30,929		92,800	
Clear Creek	2,208	1,251.67	136,889	12,420	553,475	245,000
Custer	1,000				1,260,000	
Dolores	4,099	83.11	37,595	46,500	1,787,000	2,106,000
Eagle	(1)	(1)	(1)	(1)	(1)	(1)
Gilpin	731	944.04	4,247	6,860	78,100	10,000
Gunnison	1,387	45.35	10,480	5,000	620,000	748,000
Hinsdale	330	97.76	19,490	19,000	199,000	45,000
Lake	7,067	6,881.00	2,429			
Ouray	180	64.95	1,760	6,800	87,600	83,000
Park	22	89.40	87		5,000	
Pitkin	6,676		92,222		1,337,500	52,000
Rio Grande	20	121.80	477		4,500	
Saguache	3,628	64.55	60,248		1,247,000	1,577,000
San Juan	50,616	14,888.13	766,936	1,483,000	20,471,000	22,200,000
San Miguel	36,164	43,383.44	956,972	202,500	8,376,900	100,000
Summit and Eagle	49,810	918.91	119,117	83,000	7,208,000	25,635,000
	164,299	70,512.04	2,239,878	1,865,080	43,327,875	52,801,000
Total, 1924	130,740	78,902.08	1,844,594	2,092,725	31,173,311	43,370,000
Increase or decrease from 1924	+33,559	−8,390.04	+395,284	−227,645	+12,154,564	+9,431,000

BY KINDS OF CONCENTRATES

Dry gold	7,868	8,565.57	6,459	9,960	11,400	
Dry gold and silver	342	154.65	8,927	700	89,100	
Dry silver	9,804	137.01	99,259		1,489,400	
Copper	70	1.32	581	6,000	3,000	
Copper-lead	249	44.20	17,605	18,000	175,000	
Lead	64,506	56,767.77	1,700,609	1,050,120	32,407,675	
Total to copper and lead plants	82,839	65,670.52	1,833,440	1,084,780	34,175,575	
Lead-zinc	41,812	4,712.85	384,762	776,100	8,690,700	26,961,000
Zinc	39,648	128.67	21,676	4,200	461,600	25,840,000
Total to zinc and lead-zinc plants	81,460	[2] 4,841.52	[2] 406,438	[2] 780,300	[3] 9,152,300	[4] 52,801,000
	164,299	70,512.04	2,239,878	1,865,080	43,327,875	52,801,000

AVERAGE RECOVERABLE CONTENT OF CONCENTRATES

	Fine ounces per ton	*Fine ounces per ton*	*Per cent*	*Per cent*	*Per cent*
Dry gold	1.09	0.82	0.06	0.07	
Dry gold and silver	.45	26.10	.10	13.03	
Dry silver	.01	10.12		7.60	
Copper	.02	8.30	4.29	2.14	
Copper-lead	.18	70.70	3.61	35.14	
Lead	.88	26.36	.81	25.12	
Average	.79	22.13	.65	20.63	
Lead-zinc	.11	9.20	.93	10.39	[5] 42.32
Zinc		.55		.58	[5] 38.48
Average	.06	4.99	.48	5.62	

[1] Included with Summit County.
[2] Recovered in zinc residues.
[3] Lead recovered in zinc residues and leaded zinc oxide.
[4] Zinc recovered as metal and zinc in zinc oxide.
[5] Assay of original content, with no deductions for losses.

Mine production of metals from Colorado crude ore shipped to smelters in 1925

BY COUNTIES

	Crude ore	Recovered metal content				
		Gold	Silver	Copper	Lead	Zinc
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*
Boulder	183	229.64	10,475		30,400	
Chaffee	142	21.91	3,085	2,000	37,600	
Clear Creek	1,302	1,406.16	57,779	23,580	184,325	
Custer	362	12.72	8,075		83,700	
Dolores	67	13.20	1,118	500	28,800	
Eagle	1,781	242.33	18,967	14,000	5,500	
Gilpin	1,038	1,525.87	13,736	22,140	119,400	
Grand	7	.14	774		800	
Gunnison	1,939	492.10	16,728	10,000	616,500	492,000
Hinsdale	433	99.08	7,676	4,000	175,700	
Lake	184,765	11,425.35	889,046	171,000	13,888,000	7,460,000
La Plata	905	1,164.58	22,831		2,000	
Mineral	8,047	42.81	738,735		501,000	8,000
Ouray	1,390	409.74	34,074	192,200	294,400	
Park	657	1,295.59	15,296	18,000	72,500	2,000
Pitkin	17,774		216,991		2,302,000	853,000
Rio Grande	8	48.00	35			
Saguache	156	31.54	2,788	1,500	22,600	5,000
San Juan	748	201.00	41,318	19,000	363,000	
San Miguel	1,087	205.47	102,916	17,500	628,300	
Summit	775	354.60	16,269		281,600	
	223,566	19,221.83	2,218,712	495,420	19,638,125	8,820,000
Total, 1924	184,454	39,193.84	1,354,082	620,494	16,383,750	13,357,000
Increase or decrease from 1924	+39,112	−19,972.01	+864,630	−125,074	+3,254,375	−4,537,000

BY KINDS OF ORE

Dry gold	3,099	11,825.39	18,408	28,370	102,800	
Dry gold and silver	2,095	1,692.52	37,166	28,600	70,300	
Dry silver	137,593	1,067.46	1,524,736	43,060	6,939,750	
Copper	2,193	1,936.51	53,902	286,410	59,100	
Copper-lead	417	54.65	12,768	59,500	90,800	
Lead	50,680	2,616.01	527,605	49,480	10,023,375	
Total to lead and copper plants	196,077	19,192.54	2,174,585	495,420	17,286,125	
Lead-zinc	15,688	28.15	44,076		2,351,000	4,992,000
Zinc	11,801	1.14	51		1,000	3,828,000
Total to zinc smelters and zinc oxide plants	27,489	[1] 29.29	[1] 44,127		[2] 2,352,000	[3] 8,820,000
	223,566	19,221.83	2,218,712	495,420	19,638,125	8,820,000

AVERAGE RECOVERABLE CONTENT OF CRUDE ORE SMELTED

	Fine ounces per ton	*Fine ounces per ton*	*Per cent*	*Per cent*	*Per cent*
Dry gold	3.82	5.94	0.46	1.66	
Dry gold and silver	.81	17.74	.68	1.68	
Dry silver	.01	11.08	.02	2.52	
Copper	.88	24.58	6.53	1.35	
Copper-lead	.13	30.62	7.13	10.89	
Lead	.05	10.41	.05	9.89	
Average	.10	11.09	.13	4.41	
Lead-zinc		2.81		7.49	[4] 21.42
Zinc					[4] 20.26
Average		1.61			

[1] Recovered in zinc residues.
[2] Lead recovered in zinc residues and leaded zinc oxide.
[3] Zinc recovered as zinc in zinc oxide.
[4] Assay of original content, with no deductions for losses.

Ores, slimes, and sands treated by amalgamation and cyanidation, and gold and silver contained in bullion and precipitates in Colorado in 1925

Process	Material treated	Gold in bullion	Silver in bullion	Quicksilver used	Sodium cyanide used
	Short tons	*Fine ounces*	*Fine ounces*	*Pounds*	*Pounds*
Amalgamation	700,431	100,255.48	21,913	4,495	
Cyanidation	[1] 463,922	152,346.22	24,538		[2] 309,293
		252,601.70	46,451		

[1] Includes 199,222 tons of crude ore and concentrates treated directly by cyanidation and duplicates 264,700 tons (in the form of sands and slimes) from ore and concentrates treated first by amalgamation.
[2] Reduced to equivalent of 96 to 97 per cent content.

METAL INDUSTRY

The outstanding features of 1925 in the metal-mining industry of Colorado were: An increase of 12 per cent in gross calculated value of the five metals produced despite a decrease in production of gold; in the Cripple Creek district, a decrease in gold production, but new ore bodies found on 2,900 and 3,000 foot levels of the Portland mine; in the Leadville district, increase in number of operating furnaces at the Arkansas Valley smelter from four to five, the completion of the unwatering of the Carbonate Hill-Graham Park area, the beginning of construction of a 250-ton selective flotation mill, and the decrease in gold production at the Ibex as compared with the phenomenal production in 1924; at Telluride, the continued operation of the Smuggler Union and Tomboy mines; at Eureka, the continuous operation of the Sunnyside lead-zinc mine; at Bonanza, the continued idleness of the Rawley mine, counterbalanced by the operation of the Cocomongo mine; at Rico, the reopening of the district by four companies; at Aspen and Creede, a very considerable increase in production; at Climax, the gradual increase in tonnage treated until 10,000 tons of molybdenum ore was treated in December; at Breckenridge, the continuous operation of the Wellington mine but the idleness for a large part of the year of the dredges; at Montezuma, mining and sales of lead-zinc ore; at Kokomo, the reopening of the Wilfley, Kimberley, and Uthoff adits; at Whitepine, the production of the Akron lead-zinc mines; at Ilse, the continued production of high-grade lead (cerussite) concentrates from the Terrible mine; at Gilman, the shipment of lead-zinc ores in large quantities and continued development of ore reserves; and a doubling of gross value of production for Boulder, Clear Creek, and Gilpin Counties combined.

Mine production of gold, silver, copper, lead, and zinc in Colorado in 1925

County	Number of producing mines	Ore sold or treated (short tons)	Metal content [1]			
			Gold [2]		Silver [2]	
			Fine ounces	Value	Fine ounces	Value
Adams	1		88.82	$1,836	13	$9
Arapahoe	1		2.22	46		
Boulder	42	11,854	2,639.63	54,566	41,432	28,754
Chaffee	9	142	33.57	694	3,086	2,142
Clear Creek	59	39,017	3,083.62	63,744	194,803	135,193
Custer	5	44,795	12.72	263	8,075	5,604
Dolores	8	8,288	96.31	1,991	38,713	26,867
Douglas	2		4.69	97		
Eagle	7	87,044	551.49	11,400	83,035	57,626
Gilpin	60	10,290	4,520.06	93,438	18,673	12,959
Grand	1	7	.14	3	774	537
Gunnison	11	4,960	582.62	12,044	27,235	18,901
Hinsdale	16	1,605	196.84	4,069	27,166	18,853
Lake	52	217,765	21,477.78	443,985	892,135	619,142
La Plata	9	905	1,164.58	24,074	22,831	15,845
Mineral	5	8,047	42.81	885	738,735	512,682
Moffat	2		3.29	68		
Montrose	2		28.59	591	7	5
Ouray	17	2,048	675.43	13,962	35,934	24,938
Park	8	1,123	2,555.93	52,836	15,657	10,866
Pitkin	8	52,685			309,213	214,594
Rio Grande	2	188	169.80	3,510	512	355
Saguache	8	27,156	96.09	1,986	63,036	43,747
San Juan	17	274,783	15,089.13	311,920	808,254	560,928
San Miguel	19	457,401	68,394.26	1,413,835	1,075,555	746,435
Summit	23	33,114	5,155.56	106,575	72,383	50,234
Teller	48	462,457	222,941.22	4,608,604	29,683	20,600
	442	1,745,674	349,607.20	7,227,022	4,506,940	3,127,816
Total, 1924	358	1,514,182	415,691.98	8,593,116	3,254,370	2,180,428
Increase or decrease from 1924	+84	+231,492	−66,084.78	−1,366,094	+1,252,570	+947,388

County	Metal content [1]						Total value
	Copper		Lead		Zinc		
	Pounds	Value	Pounds	Value	Pounds	Value	
Adams							$1,845
Arapahoe							46
Boulder			123,200	$10,718			94,038
Chaffee	2,000	$284	37,600	3,271			6,391
Clear Creek	36,000	5,112	737,800	64,189	245,000	$18,620	286,858
Custer			1,343,700	116,902			122,769
Dolores	47,000	6,674	1,815,800	157,975	2,106,000	160,056	353,563
Douglas							97
Eagle	14,000	1,988	4,081,500	355,090	22,700,000	1,725,200	2,151,304
Gilpin	29,000	4,118	197,500	17,183	10,000	760	128,458
Grand			800	70			610
Gunnison	15,000	2,130	1,236,500	107,575	1,240,000	94,240	234,890
Hinsdale	23,000	3,266	374,700	32,599	45,000	3,420	62,207
Lake	171,000	24,282	13,888,000	1,208,256	7,460,000	566,960	2,862,625
La Plata			2,000	174			40,093
Mineral			501,000	43,587	8,000	608	557,762
Moffat							68
Montrose							596
Ouray	199,000	28,258	382,000	33,234	83,000	6,308	106,700
Park	18,000	2,556	77,500	6,742	2,000	152	73,152
Pitkin			3,639,500	316,637	905,000	68,780	600,011
Rio Grande			4,500	392			4,257
Saguache	1,500	213	1,269,600	110,455	1,582,000	120,232	276,633
San Juan	1,502,000	213,284	20,834,000	1,812,558	22,200,000	1,687,200	4,585,890
San Miguel	220,000	31,240	9,005,200	783,452	100,000	7,600	2,982,562
Summit	83,000	11,786	3,413,600	296,983	2,935,000	223,060	688,638
Teller							4,629,204
	2,360,500	335,191	62,966,000	5,478,042	61,621,000	4,683,196	20,851,267
Total, 1924	2,713,219	355,432	47,557,061	3,804,565	56,727,000	3,687,255	18,620,796
Increase or decrease from 1924	−352,719	−20,241	+15,408,939	+1,673,477	+4,894,000	+995,941	+2,230,471

[1] In terms of metal recovered; figures are derived from individual mine reports, with allowances made for smelting recoveries and losses.

[2] Includes placer production, as follows: 1924, gold, 20,245.23 fine ounces, $418,506; silver, 4,954 fine ounces, $3,319; 1925, gold, 7,271.63 fine ounces, $150,318; silver, 1,899 fine ounces, $1,318.

REVIEW BY COUNTIES AND DISTRICTS[1]

ADAMS COUNTY

A patented gold-saving device attached to the tailrace of several gravel screening and washing plants in the bed of Clear Creek above and below Federal Boulevard recovered $1,836 in placer gold and 13 ounces of silver.

BOULDER COUNTY

Central district.—The output of the Central district, near Jamestown, in 1925 was very small. The production was the result of intermittent operations by lessees, who shipped small lots from five properties. The shipments consisted of gold ore from the Elk Head, Golden Age, and New Rival mines, and a little lead ore from the Blue Jay and Maud S. mines, shipped through the Boulder sampler. Some of this ore was taken out in the mining of fluorspar.

Gold Hill district.—The Gold Hill district produced 262 tons of ore; this yielded $8,398 in gold and 654 ounces of silver, the total value being $8,852. Of the 13 producing properties the chief mine was the Emancipation, from which gold ore was shipped to the Golden Cycle mill. Twenty-four tons of gold ore in small lots was shipped to the Leadville smelter through the Boulder sampler.

Grand Island district (Cardinal, Caribou, Eldora, and Nederland).—The Grand Island district produced 11,265 tons of ore, yielding $33,709 in gold, 35,239 ounces of silver, and 117,100 pounds of lead, having a total value of $68,352. The Fairview Mining Co. operated the Boulder County group near Nederland during 1925 and ran its 150-ton flotation and gravity concentration plant for several months. The lead concentrates containing gold and silver were shipped to the Leadville smelter. Lessees on the Caribou and Blue Bird mines shipped several cars of lead ore to Leadville. A small lot of gold ore was shipped to the Golden Cycle mill from the Gold Dust mine at Eldora.

Magnolia district.—Several small lots of ore from the Magnolia district from the Bessie, Fortune, Hereafter, Kansas City, Mountain Lion, Ophir, and Poorman mines, aggregating 104 tons, carrying $2,855 in gold, were purchased by the Boulder sampler.

Sugar Loaf district.—The Sugar Loaf district from 10 mines made an output of 219 tons of ore, which yielded $9,443 in gold, 5,485 ounces of silver, and 5,100 pounds of lead, with a total value of $13,693. Most of the ore was gold ore sent to the Golden Cycle mill through the Boulder sampler, but 38 tons of gold ore, 8 tons of lead ore, 38 tons of silver ore, and 2 tons of gold and silver ore were shipped to smelters. The largest producers were the Wood Mountain, Yellow Pine, Red Signe, Gray Copper, and Logan properties.

Ward district.—The only output of the Ward district in 1925 was a sample lot of gold ore to the Boulder sampler.

CHAFFEE COUNTY

Chalk Creek district (Romley).—The Mary Murphy mine was idle in 1925.

Granite district.—Small shipments of lead ore and silver ore went to the Leadville smelter from the Beaver, Profalgar, and other mines in 1925.

---

[1] For production by counties, see table, p. 711.

La Plata district.—The only production reported for this district was a small quantity of lead ore from the Banner mine.

Monarch-Garfield district.—There were three shipping mines in the Monarch-Garfield district in 1925. Several cars of lead-silver oxidized ore were shipped from the Jewell group and the Madonna mine.

Riverside district (Buena Vista).—The Mount Harvard group was worked in 1925, and some lead ore containing gold and silver was shipped to Leadville.

CLEAR CREEK COUNTY

Alice district (Yankee, Lincoln).—The Lombard 10-ton amalgamation-gravity concentration mill ran part of the year, and gold bullion, lead concentrates, zinc concentrates, and dry iron-gold concentrates were shipped.

Argentine district.—Silver sulphide ore from the Gold Belt Tunnel group and silver ore from the Hamill mine were shipped to a custom concentrating mill at Silver Plume and to the Leadville smelter. Silver ore was shipped from the National claim. The value of the metals recovered from ore and concentrates shipped from this district in 1925 was $33,290.

Empire district.—A few tons of gold ore from the Summit mine was shipped to the Idaho Springs sampler, but most of the production of gold was from ore mined and milled at the Mint property of the Nelson Leasing & Development Co.

Griffith district (Georgetown, Silver Plume).—Ten mines in the Georgetown-Silver Plume district produced 27,636 tons of ore, yielding $1,788 in gold, 127,059 ounces of silver, 1,000 pounds of copper, 470,150 pounds of lead, and 223,000 pounds of zinc, with a total value of $147,960. Small shipments of ore were made from the Boston, Cyclone, Griffith, and Silver Pick properties. Lead-zinc ore from the Dunkirk mine and from the Pelican dump was milled at the Jackson mill at Idaho Springs. The East Butte Copper Co. worked the Pelican and other properties. A few tons of lead ore was shipped to smelters, but nearly all the ore was milled at the company's flotation mill, installed in the old Nashotah mill. About 1,400 feet of development work was done in 1925. The St. George Mining Co. ran its 75-ton concentrating plant for a short period, shipping lead concentrates to Leadville. The Watrous 50-ton gravity-concentration and flotation mill was active part of the year; lead concentrates were shipped to Leadville and zinc concentrates to Amarillo, Tex. The Wasatch Colorado Mining Co. operated the Mendota-Frostburg mine and mill part of the year, producing lead, silver, and zinc concentrates.

Idaho Springs district.—The Idaho Springs district from 26 mines produced 2,110 tons of ore, yielding $16,103 in gold, 15,655 ounces of silver, 12,560 pounds of copper, and 95,050 pounds of lead, with a total value of $37,020. Smelting ore amounted to 387 tons, milling ore to 1,723 tons. The largest producing property was that controlled by the North American Mining Co., which mined both milling and smelting silver-lead ore from the Edgar and Bald Eagle groups. Many small lots of ore were marketed from various properties, including the Argo (in Ute Creek), Dominion, Florence, Franklin,

German, Freighter's Friend, Idaho Bride, Kangaroo, Lincoln, Little Mattie, P. T., Queen Elizabeth, Treasure Vault, and West Gold. The Combination and Newton mills were worked during part of the year. A few ounces of placer bullion was recovered by sluicing in the bed of Clear Creek.

Montana district (*Lawson, Dumont*).—The Montana district from 8 mines produced 4,193 tons of ore, yielding $863 in gold, 6,519 ounces of silver, 1,140 pounds of copper, 71,700 pounds of lead, and 6,000 pounds of zinc, with a total value of $12,243. Small lots of smelting ore were shipped from the Platts, Legal Tender, and Senator mines. Most of the ore, which was dry gold ore from the Pioneer and Syndicate mines, was amalgamated at the Syndicate mill, remodeled in 1925. The dump at the Bellevue-Hudson ground yielded silver ore which was milled at the 25-ton concentration-flotation plant. Virtually no work was done underground. The Drummond mine was operated by the Tom Moore Mining & Milling Co. for six months; a tramway was built, and several lots of lead-zinc ore were shipped to custom mills, producing lead and lead-zinc concentrates.

Trail Creek district (*Lamartine, Freeland*).—The Trail Creek district produced 1,683 tons of ore, yielding $26,310 in gold, 5,608 ounces of silver, 20,500 pounds of copper, and 4,200 pounds of lead, with a total value of $33,478. Small lots of smelting ore were shipped from the Champion, Crazy Girl, Donaldson, and Neglected mines. The 10-stamp mill at the Freeland mine handled gold ore and produced concentrates that contained mainly gold, with a little silver, copper, and lead. Dry gold ore, copper sulphide ore, and lead sulphide ore was shipped to smelters. The 10-stamp mill is equipped with tables and flotation machines.

CUSTER COUNTY

Hardscrabble district.—Three producing mines, among which were the Black Friday and Passiflora, produced 361 tons of ore yielding $263 in gold, 8,028 fine ounces of silver, and 83,700 pounds of lead, with a total value of $13,116. All of the ore, most of which was lead ore, was shipped crude to smelters.

Oak Creek district.—The one producing mine in this district was the Terrible, from which low-grade cerussite ore was concentrated at its concentration plant. The product, a high-grade lead concentrate free from silver, was shipped to the Eagle-Picher Lead Co., at Joplin, Mo.

DOLORES COUNTY

Dolores County production was from the Emma mine at Dunton and from the C. V. G., Buckhorn, Atlantic Cable-Shamrock, Nigger Baby Hill, Rico Argentine, Union Carbonate, and Yellow Jacket mines, in the Rico district. A few tons of lead ore was shipped direct to Durango. Zinc-lead ore was shipped to flotation mills at Midvale and Tooele, Utah.

The total gross calculated value of the metals produced in Dolores County in 1925 was $353,563, as compared with $24,220 in 1924. This increase in this old district was due entirely to the entrance of four strong companies attracted by the possibilities of finding zinc-lead ore and by a heavy reduction in freight rates from Rico to Salt Lake City, brought about by the International Smelting Co., of Salt Lake City.

DOUGLAS COUNTY

A few ounces of placer bullion having a fineness of 0.988 (unusually high) was recovered by sluicing gravels near Franktown.

EAGLE COUNTY

Battle Mountain district (*Red Cliff-Gilman*).—A large quantity of zinc-iron-lead sulphide ore from the Eagle mines of the Empire Zinc Co. was shipped to the company's magnetic separation plant at Canon City, from which high-grade zinc concentrates were shipped to Bartlesville, Okla., middlings to Florence, Colo., and lead, iron, and other products to Leadville. In addition, some pyrite ore, carrying silver chiefly, was shipped from this mine to lead smelters in Colorado and Utah. Other producing mines were the Pursey Chester, Groundhog, and Wyoming Valley.

Brush Creek district (*Eagle*).—Lessees of the Lady Belle-North Dakota group shipped several cars of dry silver ore, containing also a little copper, to the Garfield smelter, Utah.

EL PASO COUNTY

At Colorado Springs the Golden Cycle 1,200-ton roast amalgamation-cyanidation mill ran steadily, but not at full capacity; it chiefly treated gold ores from the Cripple Creek district and small lots of gold ore from Boulder County. The Cresson, Portland, and United Gold Mines group, in the Cripple Creek district, continued to contribute the bulk of the ore to the Golden Cycle mill.

FREMONT COUNTY

The Empire Zinc Co.'s magnetic separation plant was operated steadily, treating lead-zinc-iron and zinc-iron sulphide ore from its Eagle County mine, and its zinc oxide plant treated zinc sulphide concentrates from Hanover, N. Mex., and some zinc carbonate ore from Leadville. At Florence the River Smelting & Refining Co.'s matting and fuming plant handled lead-zinc ore and concentrates from Colorado and Utah.

GILPIN COUNTY

Southern districts (*Black Hawk, Central City, Nevadaville, Russell Gulch*).—The operation of the mines of the southern districts of Gilpin County in 1925 showed an appreciable increase over 1924. The southern districts produced 6,444 tons of ore, yielding $73,632 in gold, 18,276 ounces of silver, 28,700 pounds of copper, 194,000 pounds of lead, and 10,000 pounds of zinc, having a total value of $108,028, compared with $61,342 in 1924. This production was from small lots of bullion, concentrates, and smelter ore from 50 mines. The most important producers were the Gilpin-Eureka, Russell, West Pewabic, Becky Sharp, Wautauga, Fairfield, Snowden, Mary Miller, Orion, and Senator. Placer mines near Black Hawk produced 31.20 fine ounces of gold from sluicing stream gravels.

Northern districts.—The northern districts produced 3,846 tons of ore in 1925 from seven mines, yielding $19,161 in gold, 390 fine ounces of silver, 300 pounds of copper, and 3,500 pounds of lead, having a

total value of $19,780 as compared with $5,680 in 1924. A large part of the gold and silver was produced from ore mined at the Perigo mine, at Rollinsville, and treated at the 75-ton amalgamation and concentration mill on the property. The Newport and Star mines, also at Rollinsville, contributed gold recovered by amalgamation. Other producing properties were the Philadelphia and the Cornucopia, in the Vermilion district. The Cornucopia mine is equipped with a 25-ton amalgamation and concentration plant.

GRAND COUNTY

The only producing mine in Grand County in 1925 was the Ready Cash mine in the La Plata district, from which a few tons of lead smelting ore, containing 110 ounces of silver to the ton, was shipped.

GUNNISON COUNTY

Domingo district.—Shipments of ore from the Domingo district in 1925 amounted to 28 tons. Most of the ore was from the Good Friday and Good Hope and Vulcan mines.

Gold Brick district.—From four mines—the Carter, Big Four, Dodson, and Gold Links—in the Gold Brick district was produced 304 tons of ore in 1925, which yielded $10,057 in gold, 1,486 ounces of silver, and 9,900 pounds of lead, with a total value of $11,949, compared with $15,280 in 1924.

Tomichi district (Whitepine).—From the mines of the Akron Mines Co. 4,620 tons of zinc-lead sulphide and lead oxide ore was shipped to various custom smelters and flotation mills. The total gross calculated value of the recovered contents was $220,187 in 1925, as compared with $546,824 in 1924.

HINSDALE COUNTY

The output of metals from Hinsdale County showed an appreciable increase in 1925 over 1924. Ore buyers from Salt Lake City bought some lead-zinc ore, but most of the production in 1925 was lead ore in small lots.

Galena district.—In the Galena district, up Henson Creek, producing mines were the California, Capitol City, Fanny Fern, Highland Chief, Independence, Ocean Wave, Lellie, and Ute and Ulay. The Lellie gravity concentration and flotation mill was active part of the year, and several hundred tons of lead concentrates were shipped.

Lake district.—Producing mines were the Belle of the East, Black Crook, Cora, Pearl-Ruby, and Pelican.

LAKE COUNTY

In Lake County there was an increase in gross value of metals produced from $2,716,711 in 1924 to $2,862,625 in 1925. Gold showed a decrease of more than $500,000; zinc decreased in quantity from 9,191,000 to 7,460,000 pounds and in value from $597,415 to $566,960. The production of lead, silver, and copper increased. Placer mines yielded $36,260 in gold and 548 ounces of silver. The total quantity of ore sold or treated increased from 165,593 tons to 217,765 tons.

LEADVILLE DISTRICT

GENERAL FEATURES

Of the 217,765 tons of ore sold or treated in Lake County, 217,538 tons came from the Leadville district. The yield was 19,653.70 fine ounces of gold, 881,314 ounces of silver, 170,200 pounds of copper, 13,861,700 pounds of lead, and 7,460,000 pounds of zinc; the total calculated value was $2,815,006 out of a county total of $2,862,625.

Classification of Leadville ores in 1925

	Ore		Recovered content				
	Per-centage	Short tons	Gold	Silver	Copper	Lead	Zinc
			Fine ounces	*Fine ounces*	*Pounds*	*Pounds*	*Pounds*
Sulphide:							
Siliceous (carrying sulphides)[1]	1	1,067	474.40	13,011	27,000	61,300	
Iron pyrites[2] gold ore	21	33,000	6,881.00	2,429			
Iron pyrites[2] silver ore		13,047	815.30	254,547	30,000	1,008,300	
Lead	1	3,057	314.40	20,951	2,000	565,400	
Copper (excess silica)	1	1,150	740.70	35,454	98,500	48,900	
Zinc-iron-lead	6	12,743	[3] 28.15	[3] 31,550		[4] 1,583,000	[5] 3,637,000
	30	64,064	9,253.95	357,942	157,500	3,266,900	3,637,000
Oxide (including low-sulphur ores):							
Siliceous gold	1	1,303	7,596.20	9,135	6,500	54,600	
Silver (including old slags)	45	98,809	17.40	290,299	1,000	4,783,900	
Lead (iron excess)	2	4,932	62.80	22,581		990,800	
Lead (silica excess)	11	23,826	1,298.20	110,154	5,200	4,230,000	
Iron-manganese-silver-flux	6	12,822	7.80	91,091		535,500	
Zinc	5	11,782					[5] 3,823,000
	70	153,474	8,982.40	523,260	12,700	10,594,800	3,823,000
Metal (sulphide and oxide)			1,417.35	112			
	100	217,538	19,653.70	881,314	170,200	13,861,700	7,460,000

	Average recovery				
	Gold	Silver	Copper	Lead	Zinc
	Ounces per ton	*Ounces per ton*	*Per cent*	*Per cent*	*Per cent*
Sulphide:					
Siliceous (carrying sulphides)	0.445	12.19	1.27	2.87	
Iron pyrites gold ore	.209	.07			
Iron pyrites silver ore	.062	19.51	.11	3.86	
Lead	.103	6.85	.03	9.25	
Copper (excess silica)	.644	30.83	4.28	2.13	
Zinc-iron-lead	.002	2.48		[6] 8.87	[6] 19.97
Oxide (including low-sulphur ores):					
Siliceous gold	5.830	7.01	.25	2.10	
Silver (including old slags)		2.94		2.42	
Lead (iron excess)	.013	4.58		10.04	
Lead (silica excess)	.054	4.62	.01	8.88	
Iron-manganese-silver-flux	.001	7.10		2.09	
Zinc					[6] 20.26

[1] Much highly siliceous and in all silica exceeds iron content. A dry gold and silver ore.
[2] Iron content exceeds silica content.
[3] Recovered in residue.
[4] Recovered in residues and in leaded zinc oxide.
[5] Zinc in terms of recovered zinc in zinc oxide and leaded zinc oxide.
[6] Original content, without deductions for losses. Lead wet assay.

During 1925 the A. V. lead-bullion-copper matte smelter of the American Smelting & Refining Co., with 8 furnaces, ran 4 furnaces steadily and a fifth furnace part of the year on Colorado and Utah ores

and concentrates. When ore supplies slackened, a considerable quantity of silver ore was drawn from slag dumps of several old smelters—namely, the American, Elgin, Bi-Metallic, and Harrison Reduction works. The Western zinc-oxide plant, using Leadville low-grade zinc carbonate ores entirely, was operated steadily.

The "Leadville District" 100-ton gravity concentration mill ran continuously for 11 months on the coarsely disseminated pyrite gold ore from claims in the south end of the Ibex Mining Co.'s property, called the "South Ibex."

MINES REVIEW

Shipments of lead-zinc iron sulphide were made from the A. Y. and Minnie, Fortune, Greenback, Ibex group, Iron-Silver group, Louisville, New Monarch, Pittsburg, and Yak group of mines. Shipments of dry siliceous sulphide ore were made from the Fortune and Ibex group. Shipments of dry iron sulphide ores were made from the Ibex group and Greenback. Siliceous and lead sulphide ores were shipped from the Chautauqua, Little Alice, New Monarch, Pittsburg, Silver Spoon, and Yak mines. The copper sulphide ores came from the Fanny Rawlins and Ibex mines.

Shipments of iron-manganese-silver ores were made from the Carbonate, Henriett, Penrose, Mahala, and Morning & Evening Star group. Dry gold ores, with an excess of silica over iron content, came mainly from the Ibex group. Dry silver ores, with silica in excess of iron content, came from the Climax, Dunkin, and Mayflower. The lead oxidized ore, with silica excess, came chiefly from the Dolly B., Golden Eagle, Ibex group, Iron-Silver group, Louisville, Mahala, Penrose, Silver Spoon, Morning & Evening Star group, St. Louis Tunnel group, and Resurrection. The lead oxidized ore, with iron excess, came from the A. Y. and Minnie, Chrysolite, Henriett, Lilian, and William Wallace mines. The zinc oxidized ores came from the Chrysolite, Denver City, Dome, Henriett, Little Jonny, Little Sliver, Louisville, Robert E. Lee, Robert Emmett (Small Hopes), St. Louis Tunnel, and Tucson mines.

The Leadville Deep Mines Co. continued in 1925 the unwatering of the Graham Park-Carbonate Hill mines, started in August, 1923. The removal of the water accumulated since 1918 in Greenback and Wolftone workings was not accomplished until July, 1925. Actual mining after July on the lower levels, 1,400 feet below the bottom of the Greenback shaft, was handicapped by broken timber and mud-filled workings, but some mining was done on the upper workings of the group as the water went down. Additional crosscuts and drifts in preparation for mining and ventilation were driven, raises made, and pumping continued against the regular inflow of 1,400 gallons a minute. The unwatering project also included pumps at the Pyrenees shaft. From the Greenback and Pyrenees shafts crosscuts will also be driven to the Mikado workings, where the pumps were pulled in April, 1919.

OTHER DISTRICTS

Alicante, Colorado Gulch, St. Kevin, and Sugar Loaf districts.—Five lode mines produced 227 tons of ore, yielding 70 fine ounces of gold, 10,273 ounces of silver, 800 pounds of copper, and 26,300 pounds of lead, having a total value of $10,979. The producing mines were the Fanchon, Confident, Snow, Arty, and Tressie.

Arkansas River and tributaries placer districts.—The Mount Elbert Gold Dredging Co. repaired the Derry Ranch dredge, which is equipped with buckets of 5 cubic feet capacity, and operated it from July 1 to early in December.

Climax (Tenmile district).—The Climax Molybdenum Co.'s flotation mill at Fremont Pass ran steadily on molybdenum ore carrying less than 1 per cent MoS_2. Molybdenum in the oxidized form was lost. The mill capacity was increased month by month from 150 tons in January to 300 tons in 24 hours in December.

LA PLATA COUNTY

There was a small increase in production for La Plata County mines in 1925 over 1924. There were 9 producing mines in the California district, with an output of 905 tons of ore, yielding $24,074 in gold, 22,831 ounces of silver, and 2,000 pounds of lead, having a total value of $40,093, compared with $31,367 in 1924. The chief producing properties were the May Day, Jumbo, Little Nona, Tomahawk, and Valley View. All the ore was shipped to smelter.

MINERAL COUNTY

The output of silver from Mineral County mines (all near Creede) was 738,735 ounces. All of the ore, 8,047 tons, which was mostly silver ore, was shipped to smelters. The production of gold was only $885. The lead recovered from ores shipped was 501,000 pounds. The producing mines were the Amethyst, Bachelor, Commodore, Corsair, and New York-Last Chance-Volunteer.

OURAY COUNTY

Red Mountain district.—In the middle of the year 1925 the advent of buyers of lead-zinc ore from Salt Lake City resulted in the shipment of trial lots of this kind of ore from the Red Mountain district, which has been virtually inactive for many years. Lead-zinc ore averaging from 20 to 43 per cent in combined lead and zinc assays was shipped from the Beaver-Belfast, Imogene, and San Antonio group, the property of the latter being on the Ouray-San Juan County line. In addition, lessees on the Barstow made their annual summer mill run on gold and silver ore mined in the preceding winter and spring, and several cars of lead-silver ore were shipped from the Imogene. Several hundred tons of copper, copper-lead, and lead sulphide ores were also shipped from the San Antonio group to Salt Lake Valley smelters.

Sneffels district.—Neither the Camp Bird, Atlas, nor Humboldt mines were in operation in 1925. Lessees' desultory clean-up operations inside the mines and around the dump of the Hidden Treasure, Highland Chief, Revenue, Mountain Top, and Trust Ruby mines resulted in the shipment of single lots of lead-silver ore from each. Several hundred tons of 96 per cent fluorspar was shipped from the Thistledown mines.

Uncompahgre district.—Much mining and development work was done in the limestone and quartzite area of the Uncompahgre district. Several cars of lead ore were shipped from the Bachelor Khedive,

several cars of pyrite gold ore from the Wanakah, a car to two cars of lead ore each from the Eva, Mineral Farm, and Sutton, a car of dry silver ore from the Pony Express, and a small lot of dry silver ore from the Senorita mine.

The most interesting development work in the district was the continuous driving of a new crosscut to cut the Bachelor and Pony Express veins at a depth geologically lower than any other workings.

PARK COUNTY

Buckskin district.—A small lot of lead-zinc ore was shipped from the Little Fanny claim. A force of five men worked all year at the Sweet Home group, from which were shipped to the A. V. lead smelter several cars of lead-copper ore, carrying 65 ounces silver to the ton, 16 per cent lead, and 8 per cent copper, also 16 per cent zinc. The zinc content was, of course, not recovered.

Fairplay district.—The South Park Dredging Co.'s electrically-driven dredge, which has a bucket line of 70 buckets (each of 9 cubic feet capacity) and a capacity of 4,680 cubic feet in 24 hours, was operated just below the town of Fairplay in the South Platte River; there were 17 days idleness from January 1 to April 29; then injunctions by fishermen and farmers of the South Park compelled a stop, and work was not resumed during 1925. This dredge was first placed in operation on May 21, 1922, and was operated almost continuously to the date of closing in 1925. Small sluicing operations above Fairplay recovered some placer gold.

Hall Valley district.—Several cars of copper ore carrying 108 ounces silver and 1 ounce gold to the ton, 6 per cent copper, 4 per cent lead, and 1 to 2.30 per cent bismuth were shipped from the La Clede-Missouri group in Hall Valley district.

Mosquito district.—The cyanidation-gravity concentration-flotation mill, built in 1924 to treat ores from certain leased areas of the London mine, was changed in September, 1925, from cyanidation and concentration to amalgamation and concentration and was operated throughout the remainder of the year. During the early part of 1925 the London Mines Leasing Co. shipped to the A. V. lead smelter several hundred tons of dry gold ore averaging nearly 3 ounces gold to the ton.

PITKIN COUNTY

The gross calculated value of the silver, lead, and zinc recovered from ores and concentrates shipped from Pitkin County in 1925 was $600,011 as compared with $144,910 in 1924.

Roaring Fork district.—A new lessee of the various properties of the Smuggler Leasing Co.'s group, Durant group, and Cowenhoven Tunnel group made repairs and cleaned up the workings in 1924, and in January, 1925, began to operate the mines and the Smuggler 100-ton concentration mill. During the year this lessee shipped limestone carrying some silver, lead-silver oxidized ore, zinc-lead sulphide ore, and lead concentrates to smelters and mills in Colorado, Utah, Kansas, and Texas. Lessees shipped several thousand tons of lead-silver ore from the Spar group and several cars from the Bonnybell mine. Several hundred tons of dry silver ore was shipped by the Hope Co. Several thousand tons of lead-silver oxidized ore was shipped from the Newman Tunnel group. The Park Tunnel Mining

& Milling Co. shipped dry silver oxidized ore from the Best Friend claim and lead-silver oxidized ore from the Last Dollar claim. Two cars of lead-silver ore were shipped from the Pioneer mine.

Woody Creek district.—Several hundred tons of lead-zinc sulphide ore was shipped to Amarillo, Tex., from the Eureka, Last Chance, Tenderfoot, and Annex claims of the Aspen Contact Bimetallic Co., 7 miles northeast up Woody Creek from the Woody Creek railroad siding.

RIO GRANDE COUNTY

A small lot of high-grade gold ore was shipped from the Golconda mine, in the Summitville district. A 25-ton gravity concentration and flotation mill was built in 1925 at the Miser group, near Jasper; it ran for a short time and produced dry gold concentrates.

SAGUACHE COUNTY

The gross calculated value of metals recovered from ore mined and milled in Saguache County in 1925 was $276,633, as compared with $21,602 in 1924.

Blake district.—A car of copper-gold-silver ore, with highly siliceous gangue, was shipped by the Big Six Gold Mining Co.

Kerber Creek district.—The 75-ton Bonanza-Cocomongo gravity concentration and flotation mill, built in 1923, ran continuously in 1925, making lead-zinc and lead concentrates. Other principal producing mines were the Essie, Hortense, Rico, and St. Louis.

SAN JUAN COUNTY

Animas district.—The Animas district, including the mines in the vicinity of Silverton and south and east of Animas River from Silverton to Middleton, produced 636 tons of ore in 1925, which yielded metals with a gross value of $47,459 as compared with $54,049 in 1924. Twelve mines in all shipped some ore. Producing mines were the Acton, Aspen, Champion No. 2, Hamlet, Highland Mary, Iowa-Gold Tiger, Little Dora, Little Nation, Menomic, Old Green Mountain, Philadelphia-Little Fannie, Pride of the West, and Silver Lake. All ore was shipped direct to smelters except that from the Little Nation mine, which was concentrated and yielded copper concentrates.

Eureka district.—Producing mines in the Eureka district were the Broad Gauge, Mountain Queen, Gold King, Robert A. Bonner, and the Sunnyside group. The Sunnyside lead-zinc ore was milled at its 500-ton selective flotation mill, which was operated steadily all the year, producing high-grade zinc and lead concentrates. A lead-zinc middling from the Sunnyside mill was treated at the Reed-Coolbaugh plant at the Durango smelter.

The Sunnyside plant of the United States Smelting, Refining & Mining Co. (with the Timber Butte Milling Co., of Butte, Mont.) was one of the first to attempt large-scale selective flotation of zinc-lead ore. The ore is comparatively low in metallic content and averages as follows: Gold, 0.07 ounce to the ton; silver, 3.6 ounces to the ton; lead, 4.8 per cent; copper, 0.49 per cent; zinc, 7.2 per cent; and iron, 10 per cent. The zinc concentrates average 53.8 per cent

zinc and 5.7 per cent lead, and the lead concentrates average 46.7 per cent lead and 12.9 per cent zinc.[2]

SAN MIGUEL COUNTY

The mines of San Miguel County in 1925 produced more ore than in 1924, and the gross value of the metals recovered was almost $20,000 higher. San Miguel County mines produced 457,401 tons of ore yielding $1,413,835 in gold, 1,075,555 ounces of silver, 220,000 pounds of copper, 9,005,200 pounds of lead, and 100,000 pounds of zinc, with a total value of $2,982,562.

Iron Springs district (Ophir).—In the Ophir district in 1925 was produced 32,453 tons of ore, yielding $9,270 in gold, 149,812 fine ounces of silver, 83,600 pounds of copper, and 1,821,800 pounds of lead, with a total value of $283,607 compared with $16,476 in 1924. The two largest producing mines were the Carbonero and San Bernardo. The Carbonero ore was treated at the 50-ton concentration and flotation plant built in 1924, and lead concentrates were shipped to Durango. The Otto Mining Co. operated the San Bernardo mine and 150-ton concentration and flotation plant; lead concentrates were shipped to Durango, as well as some crude lead ore. The mine was worked throughout 1925, and the mill was active from May on through the year.

Upper San Miguel district (Telluride).—Seven mines of the Upper San Miguel district produced 424,948 tons of ore, yielding $1,404,565 in gold, 925,743 ounces of silver, 136,400 pounds of copper, 7,183,400 pounds of lead, and 100,000 pounds of zinc, with a total value of $2,698,955 as compared with $2,947,468 in 1924. As usual, most of the output of metals was from ores mined and milled by the Smuggler-Union Mining Co. and the Tomboy Gold Mines Co. (Ltd.). Other producing properties were the Alta and Black Bear. Only 254 tons of ore was shipped direct to smelters and 3,031 tons was sent to concentrating mills, while 421,663 tons of dry gold and silver ore went to amalgamation-concentration mills. Nearly all of the silver and about two-thirds of the gold was contained in lead concentrate shipped. The directors' report of the Tomboy Gold Mines Co. (Ltd.) for the year ended June 30, 1925, includes the report of the general manager at Telluride, dated August 20, 1925, excerpts of which are as follows:

Ore extracted at the mines.—A total gross of 236,479 tons was hauled from the mines to the mill. From this total 12,959 tons, or 5.48 per cent, were sorted out at the mill and discarded as waste, and 12,200.8 tons, or 5.16 per cent, were deducted for moisture content, leaving, with a loss in bin storage of 348 tons, a net total of 211,667.6 dry tons milled.

No further ore was drawn from the Argentine mine during the year.

A total of 227,594.3 wet tons, or 96.25 per cent of the tonnage sent to the mill, was drawn from the Montana. This total tonnage from the Montana was made up from several stope blocks, as follows:

From the No. 1–35 block 32,294 tons were drawn and exhausted this reserve. This tonnage was not included in the ore reserves stated for the year 1924–25, as it was supposed to be too low grade to pay. However, by grading with better ore it was possible to mill all of this at a profit.

[2] Parsons, A. B., "New York section discusses selective flotation": Eng. and Min. Jour.-Press, vol. 121, 1926, p. 542; Robie, E. H., "Selective lead-zinc flotation at Sunnyside": Eng. and Min. Jour.-Press, vol. 121, 1926, pp. 757–762.

From the No. 35–50 block, estimated to contain as of July 1, 1924, 9,675 tons, 30,741 tons were drawn, exhausting the block. The excess of 21,066 tons over the estimate resulted from caving wall rock and the bringing down of additional ore that was hung up in the upper levels.

From the No. 96–105 block, estimated to contain 13,500 tons, 43,037 tons were drawn, or an excess over the estimate of 29,537 tons, due to the same causes as obtained in the No. 35–50 block. This block is now also exhausted.

From the No. 144–167 block 88,368.3 tons were drawn.

From north of No. 167 block, principally through No. 172 chute, 7,595 tons were drawn.

And from below 1,750-foot level, mostly from the 1,900-foot level stope, 25,559 tons were hoisted and hauled to the mill.

Development driving in the Montana proper totaled but 431.5 feet and consisted of 313.5 feet of raises and 118 feet of drifting. The 1,000-foot level drift was continued north 71 feet to the end of payable ore and a stope carried up over this new section of drift to the upper limit of payable ore. An additional 47 feet of drift was in the hanging wall on 1,450-foot level, around No. 160 chute opening. A raise from the back of the 1,150-foot stope was carried up to 1,000-foot level, a distance of 66 feet, at No. 168; from the back of 1,900-foot stope a raise was carried through to 1,750-foot level, a distance of 40 feet at No. 121; at No. 142 on 1,900-foot level a raise was carried through to 1,750-foot level, with a total drive of 139.5 feet; and at No. 77 on 1,900-foot level, a raise was started and advanced 68 feet toward 1,750-foot level.

During the year the conversion of the old No. 128 raise into a hoistway was completed down to 2,050-foot level. Hoist, skip, and ore pockets were installed and hoisting of the ore started. All of the 2,050-foot level was reopened, retimbered, and new chutes built in from No. 128 to No. 110. The reopening and retimbering of 1,900-foot level was completed to No. 110 and new loading chutes built in from No. 128 and No. 110. Further, the old Revenue drift south of No. 110 was reopened and retimbered for its entire length to a distance of 825 feet south of the old No. 110 shaft. This reopening of the old workings was slow and expensive work, but the ore to be milled from these lower levels should make this expenditure well worth while.

A stope has been started in the block north of No. 167 from No. 173 to No. 185 and will be carried through to 1,600-foot level. Then all floor pillars under the several levels above will be removed, so that all ore to the north of No. 167 may be drawn on 1,750-foot level without any tramming. This is the last remaining unbroken ore above 1,750-foot level.

Another stope has been started in the block above 1,900-foot level, from No. 128 to No. 142, and two other small stopes will be started as soon as possible from 1,900-foot level south of No. 110.

Montana (Virginius).—A total of 8,885.1 wet tons, or 3.75 per cent of the tonnage sent to the mill, were drawn from the Virginius. This drawing exhausted all broken ore, and as no ore remained that would pay for mining and milling this section of the mine was permanently abandoned.

It has always been supposed, and it was logical to believe, that the northern extension of the old Tomboy vein passed through the territory near the junction of the Big Six drift and the Ophir tunnel on the Camp Bird vein. At a distance sufficiently remote from these later veins to be well away from any local disturbance 353 feet of drifting and crosscutting was done, but only a very small tight stringer picked up and further development work was abandoned.

Ore reserves stand, as of July 1, 1925, at 277,410 tons total, and are composed of 189,960 tons of broken ore and 90,450 tons of unbroken ore.

Of the total tonnage in reserve, 108,050 tons of broken ore remain to be drawn from above 1,750-foot level, south of No. 167; north of No. 167, 50,350 tons of broken ore and 31,400 tons of unbroken ore remain. Between 1,750-foot and 1,900-foot levels, an unbroken block of 24,000 tons remains between No. 128 and No. 142; a broken block of 17,675 tons between No. 128 and No. 110; an unbroken block of 5,300 tons immediately south of No. 110, and an unbroken block of 12,300 tons between No. 75 and No. 86. Between 1,900-foot and 2,050-foot levels, from No. 182 to No. 110, there remain 17,450 tons of unbroken ore and 10,885 tons of broken ore.

The 215,602 tons of ore estimated as remaining in reserve as of July 1, 1924, was drawn on only to the extent of 132,082 tons, the balance drawn during the year 1924–25 coming from unexpected sources. Had the above ore reserve figure been correct, there would now remain only 83,520 tons, but in refiguring the block above 1,750-foot level, south of No. 167, it is found that the area

drawn empty during the past year delivered several times the tonnage estimated, showing that the dilution of ore values and increase in tons contained was several times that allowed for. Therefore the broken ore remaining has been multiplied by a proportionate conservative factor, and the 277,410 tons now set up may safely be relied upon to produce a profit so long as present ore values and working costs can be maintained. It is also probable that a like revision will be necessary next year. However, the uncertainties previously pointed out, due to the impossibility of predetermining values or tonnage with any degree of accuracy, must still be borne in mind.

The mill, shops, and all other buildings and equipment have been maintained in first-class operating condition throughout the year and must, of course, be continued in such condition to enable economical and profitable operation.

No additions were made, and no new construction was required or is contemplated.

Revenue and expenditure, year to June 30, 1925

211,667.6 tons milled, yielding bullion worth			$254,070.34
Concentrate worth			646,273.94
			900,344.28
Sundry profit, boarding house, rents, etc			14,343.40
Royalty (from lessees)			3,297.64
			917,985.32
	Per ton		
Mining and development expenses	$1.29	$272,547.07	
Milling expenses	.58	121,943.14	
Concentrating expenses (including transportation to railway)	.59	124,154.07	
Water supply expenses	.18	39,121.08	
Assay office expenses	.03	5,760.28	
General expenses	.24	52,451.53	
Taxes and insurance	.16	33,964.44	
Total expenses	3.07		649,941.61
Profit			268,043.71

At this time one year ago the outlook for another year's profitable operation was fairly good, but no such profit as actually resulted was even hoped for. While the outlook of a year ago has been carried over and remains the same or even better to-day, a like profit for the coming year can hardly be expected for the reasons that ore values are quite likely to become poorer, and that there is little likelihood of being able to further reduce operating costs.

SUMMIT COUNTY

The current prices for lead and zinc in 1925 resulted in much new development in Summit County, but the output for the year was mainly from the regular producers. Dredges and hydraulic and sluice mines at Breckenridge produced 4,189.55 ounces of gold, valued at $86,606, and 1,065 ounces of silver in 1925 as compared with $280,361 in gold and 3,406 ounces of silver in 1924.

Breckenridge district.—The value of the output of the Breckenridge district from both lode and placer mines in 1925 was $688,638 as compared with $716,507 in 1924. The Wellington zinc-lead mine was operated all year and the 120-ton jig and table wet-concentration mill and the 75-ton magnetic-separation mill from May through December. The product was zinc, zinc-lead, and lead concentrates. Some lead oxidized ore was shipped direct to the smelter from the Wellington, Detroit, and Fredonia.

Two dredges, three hydraulic mines, and three sluice mines were in operation in 1925. The Bemrose-Bostwick placer, on the Breckenridge side of Hoosier Pass, was operated part of the year. The Mekka and Washington placers were hydraulicked. The Blue River Placer Mining Co.'s dredge of 88 buckets of 8 cubic feet capacity each was operated from May 18 to June 28, when the superstructure was destroyed by a fire at night. The Tonopah Placers Co. operated its

No. 1 dredge (equipped with buckets of 9½ cubic feet) from April 1 to July 28. The annual report of this company, which is a subsidiary of the Tonopah Mining Co. of Nevada, says:

> The available dredgeable area in the property of the Tonopah Placers Co. at Breckenridge, Colo., having been exhausted, operations ceased in July. Covering the four months dredging was conducted there was handled 424,140 cubic yards of gravel, resulting in a net profit of $5,496.58.

Production and income statement of Tonopah Placers Co. for the year 1925

Surplus Dec. 31, 1924		$40,098.96
Net earnings and income for year 1925:		
Gross value of bullion shipped to mint	$57,658.23	
Value of bullion from black sands	9,404.13	
Interest on investments	5,106.11	
Profit from sale of bonds	45.50	
Profit from electric-light plant	642.70	
Rental of company cottages	366.14	
Miscellaneous income	451.44	
	73,674.25	
Cost of operations	68,177.67	
Net income for year 1925		5,496.58
		45,595.54
Reserves for year 1925:		
Depletion of mineral property	$315.23	
Depreciation of plant and betterment	8,329.71	
Depreciation of Dredge No. 1	3,186.80	
		11,831.74
Surplus Dec. 31, 1925		33,763.80
Cubic yards dredged		424,140
Gold produced	ounces	2,767.88
Silver produced	do	701.87
Value per yard		$0.135

Consolidated Tenmile district (Frisco, Kokomo, and Robinson).—The Elk Mountain gravity-concentration and flotation mill was run part of the year on lead-zinc-iron ore from the Wilfley property at Kokomo. Products were lead, zinc, and iron-silver concentrates. Several cars of dry silver ore were shipped from the Golden Queen mine at Kokomo. A car of lead-silver-gold ore was shipped from the King Solomon property at Frisco. Late in November the American Metal Co. of Colorado began cleaning out the Wilfley, Kimberly, and Uthoff adits in preparation for development and search for lead-zinc ores in an area covering 3½ square miles from Robinson to Kokomo, acquired under 10-year leases.

Montezuma district.—The Bell mine, idle for 25 years, was reopened in August, 1925, and approximately 700 feet of development work was done in 1925. Several hundred tons of lead-zinc ore was shipped to Tooele, Utah, and a car of lead ore to Leadville. Other lessees on four different properties shipped a car to two cars each of lead-silver ore.

TELLER COUNTY

Mine and dump ore, slags, slimes, concentrates, and stolen bullion from the Cripple Creek district aggregated in recovered gold to United States mints and to smelters 222,941.22 fine ounces, valued at $4,608,604, as compared with $4,941,905 in 1924, and 29,683 ounces of silver, as compared with 28,076 ounces in 1924. The Golden Cycle mill at Colorado Springs, a roast-amalgamation-cyanidation plant with a daily capacity of 1,200 tons, ran steadily at about half capacity entirely on ores from the Cripple Creek dis-

trict, with the exception of several hundred tons of gold ore from Boulder County.

In 1925 an unusually large quantity of dump material was moved to the Golden Cycle mill because of a $2.50 freight and treatment charge granted for ores containing 0.25 ounce gold or less to the ton.

In the Cripple Creek district the Portland Gold Mining Co.'s Independence cyanidation and concentration mill, with a capacity of 700 tons in 24 hours, handled an average of 534 tons a day for 365 days. The operation of the Independence mill showed the following results, according to the annual report of the Portland Gold Mining Co. for the calendar year 1925:

Total input, including outside ore	dry tons	194, 902
Bullion sold		$733, 597
Concentrates sold		112, 603
		846, 200
Operating expenses at Independence mill, including marketing of concentrates		295, 259
		550, 941

MINES REVIEW

In Poverty Gulch, several thousand tons of ore was shipped from the El Paso-Gold King dump.

On Tenderfoot Hill the Reclamation Metal Mining Co. shipped ore from the Black Diamond claim from a winze below the Sangre de Christo adit.

On Globe Hill lessees from the Stratton Estate shipped several hundred tons of dump ore from the Nightingale and other claims.

Some ore was shipped from the Hoosier King (formerly Hoosier) just north of Globe Hill.

On the north slope of Ironclad Hill the producing mines were the Damon group (including the Sol Cain lease at Midway and company operations on the Hardwood claim), Forest Queen, Jerry Johnson, Pride of Cripple Creek, and W. P. H.

On Gold Hill producing mines and dumps were the Anchoria Leland, Midget, Moon Anchor, and Puzzle.

On Raven and Guyot hills the producing mines and dumps were the Adney group, Cresson, Doctor-Jack Pot, Elkton, Jo Dandy, and Mary McKinney. The Cresson mine continued to produce the largest monthly output of all the mines in the district. Shipments were made at the rate of about 9,000 tons a month. Shipments were continued from the Economic Mill dump. The annual report of the Cresson Consolidated Gold Mining & Milling Co. for the 12 months ended August 31, 1925 (dated October, 1925), says:

> During the year 112,068 dry tons of ore were shipped of a gross value of $2,139,725, averaging $19 per ton. The returns, less transportation and treatment, were $1,474,620, giving the ore a net value of $13.15 per ton. The company received as additional income the sum of $21,102 interest on bank deposits, making a grand total of $1,495,722, with total expenses of $721,435, resulting in a net gain from operations of $774,287. The total cost per ton of ore produced was $6.43. This is an increase of $1.16 per ton over 1924.
>
> You will note in our company's production of 112,068 dry tons, with an average return of $13.34 per ton, our entire cost was $6.43 per dry ton, resulting in a net profit of $6.91 per ton.
>
> Total cash at the close of the fiscal year ended August 31, 1925, was $1,288,991.

The total cost of mining per ton is divided as follows:

General expense	$0.025
Taxes	.65
Insurance	.13
Salary officers	.08
Colorado Springs office	.095
Mining operations (includes mine management and engineering)	5.45
	6.43

The higher cost of producing ore is due to $7,000 increase in State and county taxes, $34,000 increase in Federal taxes paid which was due to absorbing during 1924 a surplus sum set aside for this tax.

The actual mine expenses were increased by pumping costs, cost of operating at greater depth, and smaller tonnage.

The net returns from ore are larger than for the previous year.

The broken ore reserves and physical condition of the mine are good.

The following is a summary of the company's operations for the year ending August 31, 1925:

Development

	Feet
Drifts and crosscuts	7,463
Raises and winzes	1,843
Diamond drilling	2,177
Shaft sunk	25

The work on lower levels has been expensive on account of a large volume of water. However, the eighteenth level is now practically dry, and the flow is less on the nineteenth and twentieth. The volume of water has been from 2,000 to 3,000 gallons per minute, which cost, for power alone, about 35 cents per ton of ore shipped from the entire mine.

On the eighteenth level several bodies of ore are being broken, and while smaller than on the seventeenth level the values are good.

The nineteenth and twentieth levels are not driven to this ore-bearing zone, although small stopes on both levels are being worked.

Development work on the upper levels has resulted in discovering ore bodies of substantial tonnage and value.

The ore reserves are smaller than a year ago, but this is result of concentrating the work on the lower levels.

With installation, early in January, of a larger pump on the twentieth level, the driving on the nineteenth and twentieth, to develop both levels thoroughly, can soon be completed.

Total production, Cresson Consolidated Gold Mining & Milling Co., Colo., 1903 to December 31, 1925

Period	Dry short tons	Gross value	Freight and treatment, including war tax	Net value	Average gross value per ton	Average net value per ton	Dividends
1903 to Aug. 31, 1924	1,225,714	$25,124,523.02	$6,969,069.18	$18,155,453.84	$20.49	$14.81	
Sept. 1, 1924 to Aug. 31, 1925	112,068	2,139,725.09	665,105.52	1,474,619.57	19.00	13.15	
1903 to Aug. 31, 1925	1,337,782	27,264,248.11	7,634,174.70	19,630,073.41	20.37	14.67	
1903 to Dec. 31, 1925		27,814,195.36					$10,898,273

On Beacon Hill shipments by lessees were made from the C. K. & N. dump, El Paso dump, Henry Adney dump, and Prince Albert dump.

Producing mines on Bull Hill were the Big Banta, Blue Bird dump (Buckeye), Dante, Dexter, Gold Sovereign, Last Dollar, Londonderry, Ramona, School Section 16 (block 8), Stratton Estate (the American Eagles, Orpha May dump, and others), Trail, and Wild Horse. The Stratton Leasing Co., on the American Eagles claim, completed sinking the shaft to 2,100 feet, and did much development work on the 1,700, 1,900, and 2,100 foot levels. This shaft opened up ore on

1,700 and 2,100 levels, on the boundary line between the American Eagles and the Findley adjoining. The Dante cyanide mill was operated from April to November on material from the Dante dump.

Producing mines between Altman and Goldfield were the Acacia (Burns), Free Coinage group, Deadwood, Empire Lee, Findley, Theresa, and Vindicator.

On Battle Mountain the producing mines were the Ajax, Bonanza, Granite, Portland-Independence group, and Rose Nicol.

The annual report of the Portland Gold Mining Co. for 1925, dated February 15, 1926, says:

The manager's report shows that a large amount of development work was done on the lower levels of the mine during the year, which resulted in opening up many new ore bodies; and that the operations of your reduction plant during the same period were very successful, both as to extraction and the cost per ton.

According to the treasurer's statement your company had a cash balance of $311,396.80 on hand December 31, 1925. This is gratifying considering the unusual amount of expensive development work done during the year.

I herewith submit my report on the operation of the Portland, Independence, and Last Dollar mines and the Independence mill for the year 1925.

The production from the various properties was as follows:

	Dry tons	Gross value
Company ore from Portland and Last Dollar	5,205	$316,518
Lessees' ore to Golden Cycle	12,945	121,481
Estimated tonnage low grade shipped to Independence mill	194,898	827,537
High grade treated at Independence mill	4	18,663
	213,052	1,284,199

The mines and mill were operated at the following expense:

Operating expense at Portland	$381,545
Operating expense at Independence	31,766
Operating expense at Last Dollar	9,988
Operating expense at Independence mill, including marketing concentrates	295,259
Lessees' percentage and treatment on lessees' ore	148,904
Portland and Last Dollar milling, trucking, and freight expense	42,163
	909,625
Total production (gross content), as above	1,284,199
Less expense at plants, as above	909,625
Gross profit from operations	374,574
Less general expense and inventory adjustments	101,267
Net profit from operations	273,307

The results of operation during the past year have been very satisfactory. In spite of the fact that our gross production was less than in 1924, the profit for the year was greater due to various changes and improvements which have reduced production and milling costs. Another factor was the increased extraction at the mill, which was operated during the year more successfully than at any time in its history.

The development work on the twenty-ninth and thirtieth levels has been especially gratifying. We have blocked out on these two levels at this time 122,000 tons of ore, and are still opening new ore more rapidly than we are exhausting the known reserves. The development work on the vein known as the No. 1 East has demonstrated it to be the principal ore body now known in the mine. Our original stope on this vein on 2,700 was 225 feet in length. We are still drifting on this vein on 2,900 and 3,000, and both breasts are in ore. So far the drift on 2,900 is 350 feet in length and that on 3,000 is 540 feet in length. Recently we have found an extension of the ore body on this vein on 2,700 but on the opposite side of the phonolite dike which formed the foot wall of the old stope. This ore is of excellent grade and should persist for some distance farther north.

The other veins developed on 2,900 and 3,000 parallel for the most part the No. 1 East but are of minor importance, although they will furnish a large tonnage of mill dirt.

One of the most interesting developments in the lower levels and certainly the one of greatest importance to the district is the fact that our South drift on the No. 1 or contact vein on 2,700 has made screenings varying in value from $6 to $20 for a distance of 200 feet with the breast still in ore. This area was practically barren between 2,450 and 2,600. We are now drifting under this ore on 3,000, but the work done has not been sufficient to determine the extent of this ore body, nor has it been considered in calculating the reserves on these levels.

The bottom of the shaft is now approximately 900 feet below the drainage tunnel. The flow of water is practically unchanged in volume, remaining about 1,000 gallons per minute. The pumps installed last year are giving excellent service and easily handle what water we have.

The drift south on 2,100 toward the Independence is being continued, although our progress is slow due to the great distance from the No. 2 shaft. The breast is now in Independence ground less than 500 feet from the Independence shaft.

Within a month a winze will be started on the North No. 2 East vein on 3,000. It is planned to sink one or two lifts, if possible, on this vein and then crosscut and raise the shaft.

The grade of the mill dirt on the Independence has been very low during the past year and as a result the production was curtailed, only about 95,000 tons being hoisted there, of which about one-third was screenings. The history of this caved area has been that the grade varies greatly over a period of months, and it is only fair to assume that the grade will improve again within the year. The operation of this shaft is especially efficient, and our mill dirt is produced there at a cost lower than from any deep mining operation in this section of the country.

The controversy which extended over many years as to the ownership of the apex of the Wisconsin vein, which practically parallels the Portland-Last Dollar boundary line, was terminated during the year by the purchase of the Last Dollar property. This claim has a shaft 1,500 feet in depth and is equipped with an excellent electric hoist and air compressors. We now have a dozen leasers in this mine, most of whom are breaking ore. At the present time the Last Dollar property is paying expenses and we are accumulating a considerable asset in the stopes which are being filled. A connection has been made between this property and the Portland 1,700-foot level, and a raise is now being made from the 2,100-foot level of the Portland which will tap the lowest workings in the Wisconsin-Last Dollar area. Eventually this property will be worked entirely through the No. 2 Portland shaft.

The Portland Co. is dependent, as are practically all the mines in the district, on the Altman Water Co. for its water supply. For some years your company has owned the control of the stock in the Altman Co. and also some of the bonds. The operation of this company has not been profitable and interest on the bonds has not been paid for several years. In order to prevent foreclosure by the bondholders, all the outstanding bonds of the Altman Water Co. were recently purchased by your company.

Your property is in excellent condition. Buildings and equipment are in good repair. We have more ore blocked out and our development work is further ahead than has been the case in many years. The veins on the bottom levels are more open and better mineralized and the productive area is greater in extent than on the levels [just] above.

The mill has treated an average of 16,000 tons per month. Our extraction has been higher and operating costs lower than heretofore. In October last we treated successfully the highest grade of tonnage ever handled in the mill.

Statement of all work in Portland mine to January 1, 1926

	Total during 1925 in feet	Total previous years in feet	Grand total in feet
Drifts	3,489.0	158,242.0	161,731.0
Crosscuts	1,091.5	147,033.5	148,125.0
Raises	163.5	32,133.5	32,297.0
Winzes	64.0	6,604.0	6,668.0
Shafts		13,818.5	13,818.5
	4,808.0	357,831.5	362,639.5

The total for the Portland mine is equivalent to 68 miles, 3,599.5 feet. In addition, in the Independence mine, purchased by the Portland Gold Mining Co. in June, 1915, there is a total of 17 miles, 1,917.5 feet, of which 15 miles, 1,112 feet, had been completed to Jan. 1, 1916.

The United Gold Mines Co., controlling properties in various parts of the Cripple Creek district, in its annual report for the year ended December 31, 1925, says:

During 1925 your company has done a great deal of development work in new territory; some has been done by lessees.

The company work on the Trail and the Big Banta has resulted in additional ore of good grade. The Smith and Burbridge work on the Fairview and Freeport may develop into new ore of great value to the company.

The Vindicator has been leased the past year, but the work has not resulted in any large tonnage of ore.

The rock-crushing plant shows a good profit, but prices received from rock were lower than last year. The plant is now being moved and reset nearer the rock to be crushed.

The Stratton lease has opened a promising shoot of ore in the Findley-Shurtloff claims. The ore-bearing formation has also been cut 400 feet deeper on the twenty-first level of the Eagles shaft and a drift extended toward the ore.

Your company has put in 1,400 feet of track and pipe in the drainage tunnel to do some development work on a well-fissured section of the Trail and Big Banta. This work can be done through the Elkton shaft.

Total production of United Gold Mines Co.

	Net tons	Gross value
Ore mined before consolidation	26,310.038	$456,806.19
Produced under United Gold Mines Co	451,095.106	6,829,296.80
	477,405.144	7,286,102.99

Production of the United Gold Mines Co. in 1925

Group	Dry tons	Average gross value per ton	Gross value	Receipts from royalties	Receipts from company ore	Receipts by lessees
Deadwood	826	$17.32	$14,311	$2,002	----------	$7,795.66
Hardwood	301	11.74	3,534	290	----------	1,488.94
Londonderry	604	34.97	21,131	4,058	----------	11,710.37
Requa (Big Banta, Trail)	25,735	10.74	276,524	100	$174,546	313.14
Theresa	4,375	11.64	50,926	15,012	----------	16,752.00
Vindicator	27,072	5.88	159,298	34,742	3,416	38,590.25
Wild Horse	3,148	14.34	45,154	3,372	----------	21,462.45
W. P. H	87	14.72	1,282	314	----------	628.99
	62,148	9.21	572,160	59,890	177,962	98,741.80

NOTE.—Gross value is figured at $20 per ounce of gold, the only metal paid for.

Development work at United Gold Mines Co.'s properties in 1925

	Feet
Deadwood group:	
Ducey & Co	133
Stratton lease	713
Hardwood group:	
Cox & Co	61
Hodson & Luce	145
Amos Kellom	20
Londonderry group: Burbridge & Smith	110
Requa group:	
Eastman & Co	50
Company, Big Banta	1,471
Vindicator group: Lessees	5,458
Wild Horse group: Cain, Searles & Hill	290
W. P. H. group: A. J. Campbell	25
	8,476

On Squaw Mountain, south of Battle Mountain, the Squaw Mountain Gold Mining Co. shipped one car of gold ore from the Nellie V. and War Eagle claims.

GOLD AND SILVER

(GENERAL REPORT)

By J. P. Dunlop

PRODUCTION

DOMESTIC PRODUCTION

Approximate distribution, by producing States and Territories, of the production of gold and silver in the United States in 1925

[Figures supplied by the U. S. Bureau of the Mint]

State or Territory	Gold		Silver	
	Fine ounces	Value [1]	Fine ounces	Value [2]
Alaska	301,212	$6,226,600	766,096	$531,671
Arizona	204,471	4,226,800	7,371,358	5,115,722
Arkansas			2,835	1,968
California	641,549	13,268,200	3,240,400	2,248,838
Colorado	357,036	7,380,600	4,434,890	3,077,814
Georgia	460	9,500	47	33
Idaho	19,974	412,900	7,663,437	5,318,425
Illinois			3,674	2,550
Michigan			135,921	94,329
Missouri			44,238	30,701
Montana	84,022	1,736,900	12,596,609	8,742,047
Nevada	180,352	3,728,200	6,846,806	4,751,683
New Mexico	29,572	611,300	799,673	554,973
North Carolina	885	18,300	109	76
Oregon	18,707	386,700	35,275	24,481
Pennsylvania	121	2,500	1,458	1,012
Philippine Islands	92,067	1,903,200	48,502	33,660
Porto Rico	87	1,800	195	135
South Dakota	288,160	5,956,800	98,234	68,174
Tennessee	358	7,400	104,303	72,386
Texas	5	100	555,173	385,290
Utah	181,169	3,745,100	21,240,515	14,740,917
Virginia	5	100	5	3
Washington	11,465	237,000	165,565	114,902
Wyoming	10	200	106	74
	2,411,987	49,860,200	66,155,424	45,911,864

[1] Gold valued at $20.67+ a fine ounce.
[2] Silver valued at 69.4 cents a fine ounce. Average New York price of bar silver.

The figures in this table were obtained through cooperation between the United States Bureau of the Mint and the Bureau of Mines and were agreed upon after conference and adjustment between the two bureaus. They are therefore final for both.

The totals are based on bullion deposits in the United States mints and assay offices and on returns to the Bureau of the Mint from the smelting and refining companies. The distribution is adjusted by means of information collected by the Bureau of Mines directly from

the producing mines and tabulated for the mine reports discussed later. The data for the total production and in part for the distribution are obtained from records of (1) the unrefined domestic gold and silver deposited in United States mints and assay offices, (2) the domestic gold and silver in fine bars reported by private refineries, and (3) the unrefined domestic gold and silver contained in ore and matte exported for reduction. The last item is small.

Increase or decrease in production of gold and silver in the United States in 1925

State or Territory	Gold		Silver	
	Fine ounces	Value	Fine ounces	Value
Alaska	−2,341	−$48,400	+75,315	+$68,848
Arizona	−21,914	−453,000	+980,674	+833,964
Arkansas			+2,835	+1,968
California	+8,828	+182,500	−338,333	−162,315
Colorado	−63,822	−1,319,300	+884,987	+699,379
Georgia	+436	+9,000	+47	+33
Idaho	−7,111	−147,000	−372,921	−65,934
Illinois			−5,826	−3,815
Michigan			−19,451	−9,770
Missouri			−41,963	−27,053
Montana	−11,793	−243,800	−1,092,119	−429,400
Nevada	−39,624	−819,100	−2,486,391	−1,501,559
New Mexico	+2,830	+58,500	−35,260	−4,432
North Carolina	+788	+16,300	+85	+60
Oregon	−8,915	−184,300	−9,868	−5,765
Pennsylvania	−92	−1,900	−1,342	−864
Philippine Islands	+9,505	+196,500	+8,156	+6,628
Porto Rico	+77	+1,600	+184	+128
South Dakota	−8,925	−184,500	+8,817	+8,265
Tennessee	+29	+600	+8,761	+8,373
Texas	+5	+100	−163,252	−96,055
Utah	+27,791	+574,500	+3,418,799	+2,800,366
Virginia			+5	+3
Washington	−2,665	−55,100	−53,807	−32,077
Wyoming			+106	+74
	−116,913	−2,416,800	+748,238	+2,089,050

Domestic smelters and refiners recovered 716,488 fine ounces of gold and 69,541,418 fine ounces of silver from foreign ore and bullion, a decrease of 77,670 ounces of gold and 2,695,128 ounces of silver compared with the corresponding figures for 1924. The foreign ore came mainly from Mexico, Canada, and Peru.

The value of the new gold used in the arts and industries in the United States in 1925 was $36,161,849, compared with $37,913,310 in 1924, and the quantity of new silver used for such purposes was 29,929,163 fine ounces, compared with 24,664,236 ounces. The consumption of new silver in the arts and industries in 1925 was equal to 45 per cent of the domestic production. In addition to the gold and silver derived from foreign and domestic ore and bullion, $29,792,021 in gold and 9,897,416 fine ounces of silver were recovered from old jewelry, dental waste, silverware, and other old material. Of this, $16,524,321 in gold and 9,020,028 ounces of silver were handled by private refineries.

PRICES OF SILVER

The average monthly prices of fine bar silver in New York in 1925 were as follows:

Price of silver per fine ounce in 1925, by months

January	$0.68817	August	$0.70550
February	.68846	September	.71885
March	.68175	October	.71421
April	.67245	November	.69558
May	.67915	December	.69236
June	.69452		
July	.69769	Average	.69406

The yearly price of silver trended downward, steadily in the main, from $1.337 and $1.339 in 1865 and 1866 to a low point of $0.507 in 1915. After that date the trend was upward until 1923. The price has been unusually stable since purchases under the Pittman Act ceased.

Price of domestic silver per fine ounce, 1916–1925 [1]

1916	$0.658	1921	$1.00
1917	.824	1922	1.00
1918	.980	1923	.82
1919	1.12	1924	.67
1920	1.09	1925	.694

PRODUCTION OF GOLD AND SILVER SINCE 1792

Gold and silver produced in the United States, 1792–1925

[The estimate for 1792–1872 is by R. W. Raymond, commissioner, and for the period since 1872 by the Director of the Mint]

Period	Gold		Silver	
	Fine ounces	Value	Fine ounces	Commercial value
1792–1847 [1]	1,186,977	$24,537,000	309,500	$404,500
1848–1872	58,279,781	1,204,750,000	118,568,200	157,749,900
1873–1925	150,754,665	3,116,375,500	2,754,704,165	2,186,842,042
	210,221,423	4,345,662,500	2,873,581,865	2,344,996,442

[1] A careful investigation made by Philip B. Bekeart (Soc. California Pioneers Quarterly, Sept. 30, 1924) appears to have definitely fixed Jan. 19, 1848, as the date of the discovery of gold by James W. Marshall at Sutters Mill, Coloma, Eldorado County, Calif., and to have shown that the first flakes (not a nugget) found by Marshall are now in the National Museum, Washington, D. C.

Although the output of gold during the period 1792–1925 was less than one-fourteenth the output of silver in quantity, the value of the gold was $2,000,000,000 more than that of the silver.

The average commercial value per fine ounce of silver for the 133 years contributing to the total domestic production was $0.8161.

[1] Based on London price of bar silver 1.000 fine and taken at average price and par of exchange, 1914–1915, NewYork dealers' buying price for 1916–1919; average buying price of silver from domestic mines for 1920 to June 2, 1923; average New York price for all silver after that period.

IMPORTS AND EXPORTS

Value of gold and silver imported into and exported from the United States, 1924–25, by classes

	Imports	Exports	Excess of—	
			Imports	Exports
1924				
Gold:				
Contained in domestic ore and base bullion		$245,817		$245,817
Contained in foreign ore and base bullion	$22,589,649		$22,589,649	
Domestic bullion refined		26,838,091		26,838,091
Foreign bullion refined	196,009,351	21	196,009,330	
United States coin	29,213,499	33,225,446		4,011,947
Foreign coin	71,908,419	1,338,938	70,569,481	
	319,720,918	61,648,313	289,168,460	31,095,855
Excess imports over exports			258,072,605	
Silver:				
Contained in domestic ore and base bullion		28,650		28,650
Contained in foreign ore and base bullion	38,919,408		38,919,408	
Domestic bullion refined		90,851,274		90,851,274
Foreign bullion refined	33,441,610	14,225,232	19,216,378	
United States coin	683,023	280,465	402,558	
Foreign coin	900,861	4,505,412		3,604,551
	73,944,902	109,891,033	58,538,344	94,484,475
Excess exports over imports				35,946,131
1925				
Gold:				
Contained in domestic ore and base bullion		144,480		144,480
Contained in foreign ore and base bullion	16,205,097		16,205,097	
Domestic bullion refined	5,041,364	105,995,453		100,954,089
Foreign bullion refined	91,893,425	360	91,893,065	
United States coin	11,210,631	156,123,273		144,912,642
Foreign coin	3,922,655	376,224	3,546,431	
	128,273,172	262,639,790	111,644,593	246,011,211
Excess exports over imports				134,366,618
Silver:				
Contained in domestic ore and base bullion		33,250		33,250
Contained in foreign ore and base bullion	33,134,911		33,134,911	
Domestic bullion refined		81,451,173		81,451,173
Foreign bullion refined	29,899,214	13,157,833	16,741,381	
United States coin	999,100	318,235	680,865	
Foreign coin	562,193	4,167,094		3,604,901
	64,595,418	99,127,585	50,557,157	85,089,324
Excess exports over imports				34,532,167

DOMESTIC SUPPLY

The remarkable gain in the domestic supply of gold, indicated by the great excess of $530,000,000 in imports over exports in 1916, of $180,000,000 in 1917, and of $21,000,000 in 1918, had come to a halt in the early part of 1919 but was resumed in 1920. This excess was $667,000,000 in 1921, $238,000,000 in 1922, $294,000,000 in 1923, and $258,000,000 in 1924. The exports of gold in 1925 exceeded the imports by $134,000,000, because of large exports to the Orient, mainly India. The gold bullion exported by the United States to India was nearly 381,000 ounces greater than the domestic output.

The domestic supply of new gold comes chiefly from dry and siliceous gold ore and from placer gravel worked largely by dredges. As shown on page 753, this ore and the placer gravel supplied 80 per cent of the yield of gold in 1925, against 84 per cent in 1924. Considerable gold is usually recovered also from the refining of copper

bullion from copper ore, especially in the West Mountain or Bingham district, Utah, and the Summit Valley or Butte district, Mont.

In 1925 the copper ore of the United States yielded 15.08 per cent of the total gold, against 2.25 per cent in 1921, 5.71 per cent in 1922, 11.3 per cent in 1923, and 12.7 per cent in 1924. The natural tendency has been for the proportionate output from gold ore to decrease with declining yield from some of the principal gold camps, and for that from copper ore to increase, with a general net decline of total yield of gold owing to the preponderant output from gold and gold-silver ores.

The chief domestic supply of new silver came from lead ore, copper ore, dry and siliceous silver and silver-gold ores, and lead-zinc ore, in the proportion of 28.15, 27.06, 25.63, and 17.36 per cent, respectively, in 1925, against 29.43, 25.50, 31.82, and 11.27 per cent in 1924. The greater part of the dry and siliceous silver ore is milled and cyanided at or near the mines, but a small quantity of richer ore is shipped to copper and lead smelters.

WORLD'S PRODUCTION OF GOLD

The estimated value of the gold produced in the world from 1860 to 1925, inclusive, was $15,481,942,700. In 1925 the estimated production of the world was $395,968,000, an increase of about $2,507,000 over that of 1924. This increase followed a period of successive annual decreases from 1915 to 1922, and an increase of $48,433,300 in 1923 and of $25,607,400 in 1924. The production in 1925 in the United States decreased $2,416,800. The production in Canada increased $4,348,400, or 14 per cent. Most of the increased output of gold has been due to larger production at the Rand mines in South Africa and at mines in Canada. The general opinion of prominent geologists and engineers is that the relatively subordinate position of the United States as a producer of gold will be permanent, though the future annual output may slightly increase in certain years. On the whole, however, the output is more likely to decrease over a period of years. In the following table is shown the output of gold by countries, as given by the Bureau of the Mint with slight changes resulting from late information.

World's production of gold, 1920–1925

Country	1920	1921	1922	1923	1924	1925
North America:						
Canada	$15,853,500	$19,148,900	$26,116,000	$25,495,400	$31,532,400	$35,880,800
Central America	3,000,000	2,500,000	2,500,000	2,000,000	1,866,000	2,000,000
Mexico	15,265,900	14,152,600	15,469,200	16,158,400	16,480,100	16,309,900
United States [1]	51,186,900	50,067,300	48,849,100	51,734,000	52,277,000	49,860,200
South America:						
Argentina	100,000	75,000	75,000	80,000	60,000	55,000
Bolivia	5,000	6,000	8,400	8,400	19,900	8,000
Brazil	2,600,000	2,780,000	3,031,900	2,990,700	2,990,700	2,243,000
Chile	900,000	933,100	1,650,200	1,331,200	1,400,000	2,188,500
Colombia	5,800,000	6,000,000	5,700,000	5,700,000	2,000,000	2,000,000
Ecuador	750,000	749,500	877,600	877,600	800,000	750,000
Guiana—						
British	200,000	265,200	224,800	168,900	131,000	188,300
Dutch	258,500	233,300	247,900	263,200	214,000	204,700
French	900,000	1,000,000	1,008,200	922,500	1,312,600	831,400

[1] Includes Philippine Islands.

World's production of gold, 1920–1925—Continued

Country	1920	1921	1922	1923	1924	1925
South America—Contd.						
Peru	$1,297,300	$1,599,700	$1,683,400	$2,488,300	$2,459,000	$2,433,800
Uruguay	400	7,000	7,000	200	200	
Venezuela	389,400	625,400	358,900	358,900	358,900	631,300
Europe:						
Austria		3,300	11,300	15,300	40,500	38,500
Czechoslovakia	181,100	235,900	171,400	69,100	186,100	156,800
France		49,100	332,300	350,200	409,400	764,300
Germany	91,700	86,400	112,300	132,900	132,900	133,000
Great Britain	700					
Greece	10,600		8,600	8,600	8,000	
Italy	15,600			25,200	31,900	39,900
Rumania		856,000	888,500	996,900	871,300	1,031,500
Russia and Siberia	1,182,900	892,600	3,032,600	5,181,900	19,805,100	21,931,800
Spain			18,700	18,700	20,000	
Sweden	4,700	1,300	700			
Turkey			29,900	29,900	19,300	19,300
Yugoslavia	66,500	82,400	143,500	126,900	161,500	156,800
Asia:						
China	2,584,000	2,067,200	2,067,200	1,850,100	2,218,100	2,218,100
Chosen	1,571,100	2,705,800	2,643,800	2,510,200	2,772,700	3,035,100
East Indies—						
British	600,000	500,000	600,000	600,000	500,000	500,000
Dutch	1,879,500	1,946,600	2,156,000	2,388,600	2,571,300	2,743,500
Federated Malay States	265,700	276,700	310,200	190,000	309,200	292,400
India, British	10,316,700	8,945,200	9,054,600	8,729,900	8,193,200	8,140,700
Indo-China	3,300	3,300	99,700	128,300	7,200	7,200
Japan	5,130,400	4,901,400	4,833,300	5,111,700	5,054,300	6,557,800
Sarawak	338,000	353,300	22,700	20,800	17,700	17,700
Taiwan	279,000	588,200	453,900	453,900	178,800	186,800
Africa	191,339,800	186,968,400	165,774,100	209,954,000	219,579,700	218,497,300
Australasia	22,651,700	18,672,700	18,847,200	18,382,600	16,536,800	13,914,600
	337,019,300	330,278,800	319,420,100	367,853,400	[2]393,460,800	[3]395,968,000

[1] Revised figures.
[3] Revised figures will be given in the report for 1926.

WORLD'S PRODUCTION OF SILVER

The figures for the world's production of silver in 1925 show that the United States and Canada produced 35 per cent of the total, against 36 per cent in 1924, and that Mexico, Central America, and South America produced 51 per cent, so that only 14 per cent (34,579,300 ounces) came from all other countries, mainly from Australasia, Japan, Burma, Germany, Spain, and Dutch East Indies. The total increase in the world's production in 1925 was 4,698,300 ounces. The average monthly open-market price ranged from $0.68593 per ounce to $0.72277. The value of the silver produced in the world in 1925, at $0.70346 a fine ounce, was $171,771,000, and the total value from 1860 to 1925, inclusive, was $6,732,295,500.

World's production of silver, 1920–1925, in fine ounces

Country	1920	1921	1922	1923	1924	1925
North America:						
Canada	12,793,500	13,134,900	18,581,400	17,754,700	19,736,300	20,229,000
Central America	2,700,000	2,000,000	2,000,000	2,500,000	2,686,200	2,700,900
Mexico	66,662,200	64,465,400	81,076,900	90,859,100	91,486,100	92,885,500
United States [1]	55,361,600	53,052,400	56,240,100	73,335,200	65,407,200	66,155,400
South America:						
Argentina	30,000	25,000	25,000		20,000	18,000
Bolivia	2,200,000	2,758,900	5,373,500	5,212,800	4,857,600	4,346,500
Brazil	30,000	33,000	25,700	28,600	28,600	1,800
Chile	2,604,400	2,200,000	2,709,200	3,337,500	3,357,700	3,261,700
Colombia	480,000	500,000	3,200	3,100	2,900	2,900
Ecuador	35,000	75,000	75,000	75,000	70,000	70,000
Guiana	8,000	9,000	9,000	8,500	8,700	8,500
Peru	9,196,300	10,008,600	13,169,800	18,654,800	18,717,100	19,917,500
Uruguay	500	2,000	2,000			
Venezuela	3,500	2,700	2,700	2,700	2,700	3,200
Europe:						
Austria	14,000	10,560	8,600	14,200	28,700	23,900
Czechoslovakia	680,100	703,100	875,200	702,300	732,500	707,300
France	321,500	321,500	209,000	213,000	147,900	201,400
Germany	3,305,000	3,387,400	3,581,500	3,753,600	3,753,000	3,858,000
Great Britain	76,400	11,300	27,600	34,600	31,100	32,400
Greece	220,900		184,100	184,100	160,700	254,300
Italy	297,500	199,300	204,700	385,800	497,000	320,800
Norway	323,200	196,100	205,200	297,900	424,400	385,880
Poland					192,900	212,200
Rumania		96,500	83,300	84,800	72,200	75,000
Russia	50,000	40,000	150,000	192,900	250,000	250,000
Spain	2,956,500	2,679,400	2,778,200	2,778,200	2,880,900	3,303,900
Sweden	11,600	13,300		600		
Turkey	100,000	100,000	8,000	8,000	219,900	219,900
Yugoslavia	15,000	15,900	26,800	24,600	31,200	26,100
Asia:						
Burma	2,700,000	3,437,600	4,094,300	4,713,100	5,284,200	4,831,500
China	50,000	40,000	100,000	100,000	110,000	110,000
Chosen	1,200	3,000	10,700	39,300	54,700	70,200
East Indies, Dutch	1,027,900	1,022,000	1,109,600	1,579,000	2,083,300	2,385,000
India, British	170,600	150,000	150,000	150,000	25,000	23,400
Japan	4,892,400	4,187,700	3,886,300	3,597,400	3,542,300	4,838,600
Sarawak	5,200	3,400	500			
Taiwan	20,000	26,500	23,400	23,400	11,000	13,200
Africa:						
Algeria	150,000					
Belgian Congo	10,700	5,800	6,500	8,700		
British West Africa (Gold Coast, Ashanti, Nigeria)				70		
East Africa, French	13,800	12,900	12,900			
East Africa, Portuguese	700	500	500			1,300
Egypt	300					
Rhodesia	164,900	161,900	184,400	161,500	401,300	158,000
Tanganyika					700	1,000
Transvaal, Cape Colony, Natal	891,300	830,800	1,115,700	1,373,900	1,396,900	1,161,500
Australasia	2,684,900	5,362,200	11,484,900	13,818,700	10,769,900	11,114,600
	173,260,600	171,285,500	209,815,400	246,011,070	[2] 239,481,900	[3] 244,180,200

[1] Includes Philippine Islands.
[2] Revised figures.
[3] Revised figures will be given in the report for 1926.

Most of the world's output of silver is produced or refined in the United States, but a large part of it is consumed in Great Britain, India, and China, and the price of silver has been dominated by the London market. Silver, Its Romance and History, by Benjamin White, which contains information relating to the buying and selling of silver and the fixing of market quotations, was quoted in the chapter on gold and silver in Mineral Resources for 1918.

The total quantity of silver used in the arts and manufactures was 39,826,579 fine ounces, or about 6,200,000 ounces more than in 1924. The silver used in the photographic and chemical industries was about 6,000,000 ounces, an increase of about 20 per cent. The exports of

silver to China in 1925 were much less than in 1924, and stocks of silver accumulated there owing to disturbed political conditions, causing stagnation of trade. Fortunately agricultural conditions in India continued excellent, and unusually large quantities of silver were exported there in settlement of foreign balances. Conditions in China and India (which absorb 65 per cent of the production of silver) were unchanged in the early part of 1925, so that the market for silver was stable and featureless with comparatively a small range in prices.

MINE REPORT

METHOD OF COLLECTING STATISTICS

The first table in this report presents the final official figures of the production of gold and silver in the United States in 1925 as agreed upon by the Bureau of the Mint and the Bureau of Mines. With the comparatively unimportant exceptions of domestic gold and silver contained in ore and matte exported for reduction during the year, these figures record the production of gold and silver bullion from domestic ore in marketable form as metals, either refined or unrefined.

To trace this total gold and silver produced back to its source by States, counties, and mining districts, the Bureau of Mines makes a systematic investigation of the "mine production" of ores containing gold and silver and of the output of the placer mines, the output being classified by methods of production and by kinds of ore, as well as by mining districts. The resulting figures form the basis of the mine reports.

Of the two plans for ascertaining the gold and silver production, one is a measure of the metallurgic industry and the other a measure of the mining industry; one reports the metal actually recovered in marketable form and the other the mine output and its recoverable content. The two methods will not produce exactly corresponding results, but the figures for a period of years sufficiently long to compensate for overlap or lag should agree within allowable limits of error.

Gold and silver produced in the United States, 1905–1925, according to mint and to mine returns

Year	Mint		Mine	
	Gold	Silver	Gold	Silver
		Ounces		*Ounces*
1905–1915	$1,038,286,100	671,818,275	$1,031,369,692	672,280,562
1916	92,590,300	74,414,802	92,822,430	78,875,176
1917	83,750,700	71,740,362	82,032,745	70,665,531
1918	68,646,700	67,810,139	67,701,936	68,063,090
1919	60,333,400	56,682,445	58,225,112	51,907,869
1920	51,186,900	55,361,573	50,537,281	56,559,022
1921	50,067,300	53,052,441	49,788,750	46,359,147
1922	48,849,100	56,240,048	48,932,109	61,235,983
1923	51,734,000	73,335,170	51,400,382	70,393,639
1924	52,277,000	65,407,186	52,180,812	64,113,882
1925	49,860,200	66,155,424	49,645,444	66,776,275
	1,647,581,700	1,312,017,865	1,634,636,693	1,307,230,176

These figures show, according to the reports of the mint, a total excess of gold for the 21 years of $12,945,007, or a difference of 0.8 per cent, and a total excess of silver of 4,787,689 ounces, or a difference of 0.36 per cent. The small differences are fully accounted for in the detailed discussions of the subject in previous reports of this series.

UNITS OF MEASUREMENT

In the measurement of ores and concentrates the short ton of 2,000 pounds is used throughout. The price of gold is fixed by law at $20.67+ per fine ounce. The annual average prices for silver from 1916 to 1925 are given on page 733.

PRODUCTION OF GOLD AND SILVER REPORTED FROM THE MINES

Mine production of gold and silver in the United States in 1925

State or Territory	Gold		Silver		Increase or decrease from 1924	
	Fine ounces	Value	Fine ounces	Value	Gold	Silver (fine ounces)
Alaska	307,678.59	$6,360,281	698,259	$484,592	+$74,557	+28,618
Arizona	201,740.92	4,170,355	7,257,868	5,036,961	−708,110	+608,592
Arkansas			3,118	2,164		+3,118
California	632,035.31	13,065,330	3,054,416	2,119,765	−84,845	−500,717
Colorado	349,607.20	7,227,022	4,506,940	3,127,816	−1,366,094	+1,252,570
Georgia	468.41	9,683	46	32	+9,028	+41
Idaho	20,886.92	431,771	7,743,439	5,373,947	−124,752	−49,715
Illinois			3,000	2,082		−5,891
Michigan			139,499	96,812		+9,118
Missouri			83,340	57,838		−20,354
Montana	82,122.85	1,697,630	13,158,191	9,131,784	−325,195	−131,112
Nevada	187,104.72	3,867,798	7,096,618	4,925,053	−637,888	−2,314,761
New Mexico	26,561.40	549,073	735,124	510,176	+36,338	−59,946
North Carolina	896.87	18,540	108	75	+14,000	+77
Oregon	18,982.80	392,409	32,793	22,758	−159,433	−5,310
Pennsylvania	237.04	4,900	3,120	2,165	+476	+310
Philippine Islands	94,137.28	1,945,990	66,000	45,804	+294,194	+22,873
Porto Rico	87.09	1,800	195	136	+1,600	+184
South Dakota	289,747.10	5,989,604	96,133	66,716	−127,817	+9,585
Tennessee	358.99	7,421	102,949	71,446	+621	+8,170
Texas			552,000	383,088		−168,739
Utah	177,803.08	3,675,516	21,276,689	14,766,022	+647,364	+4,022,997
Virginia	3.29	68	5	4	−48	+2
Washington	11,138.49	230,253	166,425	115,499	−79,364	−47,317
	2,401,598.35	49,645,444	66,776,275	46,342,735	−2,535,368	+2,662,393

The preceding table gives the quantity and value of the gold and silver ("mine production") by States reported from the producing mines in 1925 to the Bureau of Mines and the increase or decrease by comparison with the corresponding figures for 1924.

The decrease of $2,535,368 in the mine production of gold in 1925 followed an increase of $780,430 in 1924 and of $2,468,273 in 1923 and decreases of $856,641 in 1922, $748,531 in 1921, $7,687,831 in 1920, $9,476,824 in 1919, $14,330,809 in 1918, and $10,789,685 in 1917. The increase of 2,662,393 ounces in silver in 1925 followed a decrease of 6,279,757 ounces in 1924 and increases of 9,157,656 ounces in 1923 and 14,876,836 ounces in 1922.

The principal gold-producing States in 1925 were California, Colorado, Alaska, South Dakota, Arizona, and Nevada, and these six States made 82 per cent of the total output. The notable increases

in gold were in Alaska, New Mexico, Philippine Islands, and Utah. The most notable decreases in gold were in Arizona, California, Colorado, Idaho, Montana, Nevada, Oregon, South Dakota, and Washington.

The principal silver-producing States in 1925 were Utah, Montana, Idaho, Arizona, Nevada, Colorado, and California, and these 7 States produced 96 per cent of the total.

About $29,666,000 in gold, or 60 per cent of the entire output in the United States in 1925, was produced by 25 companies, none of which produced less than $446,000. The largest producer was the celebrated Homestake mine, in South Dakota. Sixteen of these large properties produced gold from dry and siliceous ore, three produced it from gravel by dredging, five from copper ore, and one from copper ore and siliceous ore. Eight were in California, five in Colorado, four in Arizona, three in Nevada, two in Alaska, and one each in Montana, South Dakota, and Utah.

Larger producers of gold in the United States in 1925, in order of output

Rank	Operator	State	Mining district	Source of gold
1	Homestake Mining Co	South Dakota	Whitewood	Dry and siliceous ore.
2	Yuba Consolidated Goldfields	California	Marysville	Dredging gravel.
3	Alaska Juneau Mining Co	Alaska	Juneau	Dry and siliceous ore.
4	Cresson Consolidated Gold Mining & Milling Co.	Colorado	Cripple Creek	Do.
5	Utah Copper Co	Utah	West Mountain	Copper ore.
6	Natomas Co. of California	California	Oroville and Folsom	Dredging gravel.
7	Portland Gold Mining Co	Colorado	Cripple Creek	Dry and siliceous ore.
8	Empire Mines Co	California	Grass Valley	Do.
9	Sixteen to One Mines Co	do	Allegheny	Do.
10	United Verde Copper Co	Arizona	Verde	Copper ore and siliceous ore.
11	Comstock Merger Mines Co	Nevada	Comstock	Dry and siliceous ore.
12	Kennedy Mining & Milling Co	California	Jackson	Do.
13	Smuggler Union Mining Co	Colorado	Upper San Miguel	Do.
14	North Star Mines Co	California	Grass Valley	Do.
15	Nevada Consolidated Copper Co.	Nevada	Robinson	Copper ore.
16	Phelps Dodge Corporation (Copper Queen).	Arizona	Warren	Do.
17	Argonaut Mining Co	California	Jackson	Dry and siliceous ore.
18	Hammon Consolidated Gold Fields.	Alaska	Nome	Dredging gravel.
19	Anaconda Copper Mining Co	Montana	Summit Valley (Butte).	Mainly copper ore.
20	Tomboy Gold Mines Co	Colorado	Upper San Miguel	Dry and siliceous ore.
21	United Gold Mines	do	Cripple Creek	Do.
22	Elkoro Mines Co	Nevada	Jarbidge	Do.
23	Carson Hill Gold Mines	California	Mother Lode	Do.
24	Calumet & Arizona Mining Co	Arizona	Warren	Copper ore.
25	Tom Reed Gold Mines	do	Oatman	Dry and siliceous ore.

Besides the output of gold by these large operators, $18,031,600 came from about 3,650 placer and lode mines, not including those of Philippine Islands and Porto Rico, many of which produced between $100,000 and $300,000 each. Hundreds of mines, especially placer properties in California, Oregon, Idaho, Alaska, Arizona, and the Appalachian States, produced very small quantities of gold, and the average value of output of the smaller mines was about $5,000.

The Benguet Consolidated Mining Co., Philippine Islands, according to its printed report, produced about $1,400,000 in gold in 1925 (see p. 748). Only five companies in the United States exceeded that output.

The largest output of silver was that of the mines operated by the Anaconda Copper Mining Co., followed by the Tintic Standard Mining Co. Of the mines enumerated in the subjoined list, five recovered silver from dry and siliceous ore, four from lead ore, four from copper ore, five from copper ore and lead or lead-zinc ore, three from siliceous and lead or lead-zinc ore, two from lead and lead-zinc ore, one from lead-zinc ore, and one from copper ore and siliceous ore. The California Rand mine, California, and the Presidio mine, in Texas, were the largest producers of silver from ore that contained no appreciable quantity of any other metal. The output of the 25 properties listed was 41,076,000 ounces, or 62 per cent of the total. Eight of the largest producers were in Utah, four each in Nevada and Arizona, three each in Montana and Idaho, two in Colorado, and one in California. None of the 25 companies produced less than 571,000 ounces in 1925.

Larger producers of silver in the United States in 1925, in order of output

Rank	Operator	State	Mining district	Source of silver
1	Anaconda Copper Mining Co.	Montana	Summit Valley (Butte).	Copper ore and lead-zinc ore.
2	Tintic Standard Mining Co.	Utah	Tintic	Lead and siliceous ore.
3	Park Utah Mining Co.	do	Blue Ledge	Siliceous and lead-zinc ore.
4	Chief Consolidated Mining Co.	do	Tintic	Lead and siliceous ore and lead-zinc ore.
5	Silver King Coalition Mining Co.	do	Uintah	Lead ore.
6	United Verde Copper Co.	Arizona	Verde	Copper and siliceous ore.
7	California Rand Silver (Inc.)	California	Randsburg	Dry and siliceous ore.
8	Butte & Superior Mining Co.	Montana	Summit Valley	Copper ore and lead-zinc ore.
9	Federal Mining & Smelting Co.	Idaho	Hunter and Warm Springs.	Lead ore and lead-zinc ore.
10	Hecla Mining Co.	do	Lelande	Lead ore.
11	Bunker Hill & Sullivan Mining & Concentrating Co.	do	Yreka	Do.
12	Tonopah Extension Mining Co.	Nevada	Tonopah	Dry and siliceous ore.
13	Comstock Merger Mines Co.	do	Comstock	Do.
14	Park City Mining & Smelting Co.	Utah	Snake Creek	Lead and lead-zinc ore.
15	Utah Apex Mining Co.	do	Bingham	Copper, lead, and lead-zinc ore.
16	United States Smelting, Refining & Mining Co.	do	West Mountain	Lead and lead-zinc and copper ore.
17	Phelps Dodge Corporation	Arizona	Warren	Copper ore.
18	Utah Copper Co.	Utah	West Mountain	Do.
19	Magma Copper Co.	Arizona	Pioneer	Do.
20	Calumet & Arizona Mining Co.	do	Warren	Do.
21	Withrow Leasing Co.	Colorado	Creede	Siliceous ore.
22	Tonopah Belmont Development Co.	Nevada	Tonopah	Dry and siliceous ore.
23	Elm Orlu Mining Co.	Montana	Summit Valley (Butte).	Copper ore and lead-zinc ore.
24	Sunnyside Mining & Milling Co.	Colorado	Eureka	Lead-zinc ore.
25	Betty O'Neal Mines Co.	Nevada	Lewis	Lead ore.

MINE PRODUCTION OF GOLD AND SILVER, BY STATES

ALASKA

Gold.—The yield from siliceous ore increased from $2,705,138 in 1924 to $3,101,715 in 1925, and that from copper ore increased from $13,341 to $32,778; the placer output decreased from $3,564,000 to $3,223,000. Twenty-seven dredges produced $1,572,312 of the placer gold, which was $8,951 more than the dredge output in 1924.

The 3,573,540 tons of siliceous ore treated in 1925 yielded an average of $0.88 in gold and silver to the ton, and the 860,023 tons of copper ore yielded $0.52 in gold and silver to the ton.

About 49 per cent of the total output of gold in Alaska in 1925 came from gold lode mines, against 43 per cent in 1924. Dredges handled 3,144,624 cubic yards of auriferous gravel and made an average recovery of 50 cents a cubic yard against 36 cents in 1924. The estimated total recovery of gold by dredging for the period 1903–1925 is $29,859,474.

Silver.—The mine production of silver in Alaska in 1925 was 698,259 fine ounces, against 669,641 ounces in 1924. Copper ore yielded 596,607 ounces; siliceous ore, 67,186 ounces; placers, 24,144 ounces; and lead ore, 10,322 ounces.

ARIZONA

Gold.—Of the mine production of gold in Arizona in 1925, placers contributed only $4,267. The lode mines produced $4,166,088, of which 18 per cent came from dry and siliceous ore, chiefly from Mohave, Yavapai, and Cochise Counties, and 76 per cent from copper ore, chiefly from Cochise and Yavapai Counties. Mohave County had a gold output of $601,622, Cochise County $1,394,177, and Yavapai County $1,349,217. The gold recovered from ore and tailings treated at gold and silver mills represented 14.5 per cent of the total lode-mine output, against 35 per cent in 1924, and crude ore shipped to smelters yielded 62 per cent. The crude copper ore mined and smelted directly (without previous concentration) yielded an average of about 82 cents in gold a ton.

Silver.—Of the mine production of silver in Arizona, 5,795,173 ounces came from copper ore, 803,153 ounces from lead ore, 505,727 ounces from dry and siliceous ore, and 144,567 ounces from copper-lead ore. Cochise County produced 2,316,531 ounces in 1925, of which 1,369,502 ounces came from copper ore and 264,380 ounces from siliceous ore, and Yavapai County produced 2,762,143 ounces, mainly from copper ore. Bullion recovered from gold and silver ores, almost all by cyanidation, yielded 22,872 ounces of silver, concentrates 1,675,967 ounces, and crude ore shipped to smelters 5,501,702 ounces.

ARKANSAS, MISSOURI, OKLAHOMA, ILLINOIS, AND KENTUCKY

The lead and zinc mines of the Central States produce no gold and only a small quantity of silver. Nearly all the silver is a by-product from the refining of lead from concentrates of lead ores mined in southeastern Missouri. All the silver, except 6 ounces, from Missouri in 1925 was derived from lead recovered from 89,000 tons of galena concentrates produced in southeastern Missouri. Lead concentrates from the Joplin region contain about one-tenth ounce of silver a ton which is not recovered.

The lead-zinc-fluorspar deposits of the Kentucky-Illinois field carry silver, and the average silver recovery from lead concentrates from Illinois in 1925 was 3.76 ounces to the ton. No silver ore was shipped from the Criswell mine, near Byars, McClain County, Okla., in 1925.

The Kellogg mine in Pike County, Ark., yielded 3,118 ounces of silver from lead and zinc concentrates shipped to smelters. This mine was closed down early in 1925.

CALIFORNIA

Gold.—In 1925 the lode mines of California produced $7,969,186 in gold (a decrease of $592,617), of which gold-quartz yielded 95 per cent, and the placers $5,096,144 (an increase of $507,772). Of the placer production, $4,750,842 was recovered by dredging. The total dredge production from 1896 to the end of 1925 has been $145,121,297, and the production by dredges in 1925 was equal to 36 per cent of the total for the year. The eight Yuba County dredges made the largest output, its value being $2,560,665, an increase of $576,496. Six dredges in Sacramento County made an output of $1,300,486, an increase of $155,411. In Butte County, including Oroville and other districts, three dredges produced $235,554, or $178,137 less than in 1924. Dredges were also operated in Calaveras, Placer, Shasta, Stanislaus, and Trinity Counties.

Five of the 34 counties reporting mine production of gold had a yield of more than $1,000,000 each in 1925. Of these Yuba and Sacramento Counties obtained most of their gold by dredging, Amador County is on the Mother Lode, and Nevada County produced gold mainly from siliceous ore of the Grass Valley district. The five Mother Lode counties—Amador, Calaveras, Eldorado, Mariposa, and Tuolumne—whose output is mainly gold milling ore, produced $2,445,258 in gold from mill bullion and $670,988 from concentrates made from gold ore in 1925, against $2,653,236 from mill bullion and $662,690 from concentrates in 1924.

Silver.—Of the mine production of silver in California in 1925, siliceous ore yielded 2,097,419 ounces; copper ore, 704,506 ounces; lead ore, 174,494 ounces; zinc ore, 33,492 ounces; lead-zinc ore, 25,926 ounces; and placers, 18,579 ounces. The only counties producing more than 100,000 ounces of silver in 1925 were Inyo, Plumas, San Bernardino, and Shasta. Seventy-eight per cent of the silver was recovered from ore sent to concentrating plants.

COLORADO

Gold.—The total mine production of gold in Colorado in 1925 showed a large decrease from 1924. The Cripple Creek district, with a decrease of $333,301, produced $4,608,604 in gold, or 64 per cent of the State output.

The San Juan region, in Dolores, La Plata, Ouray, San Juan, and San Miguel Counties, produced $1,765,782; and Lake County produced $443,985, a decrease of $536,169. Siliceous and dry ores, forming 68 per cent of all the ore sold or treated, yielded 92 per cent of the total output of gold; 4.6 per cent came from lead-zinc ore, 2 per cent from placers, and the remainder from ore of other classes. The gold recovered by amalgamation from 700,431 tons of ore amounted to 100,255 fine ounces, and that recovered by cyanidation to 152,346 fine ounces.

The placer production in 1925 was 7,271.63 ounces, a decrease of 12,973.60 ounces. Dredges in Summit, Park, and Lake Counties produced 94 per cent of the placer gold.

Silver.—Lake County, mainly Leadville, produced 892,135 ounces of silver, an increase of 372,675 ounces. San Miguel County produced 1,075,555 ounces, an increase of 81,416 ounces. Pitkin County produced 309,213 ounces, San Juan County 808,254 ounces, and Mineral County 738,735 ounces. Siliceous and dry ores yielded 63 per cent of the silver recovered, and lead-zinc ore 23.6 per cent.

IDAHO

Gold.—The total production of gold in Idaho from the discovery of placer gold in 1863 to the end of 1925 is estimated by C. N. Gerry at $135,615,470.

Shoshone County produced 32 per cent and Elmore County 27 per cent of the total output in 1925. The lode mines produced $169,385 in gold and the placers $262,386, of which $229,489 was won by dredging. The total output of gold recovered by dredges from 1897 to the end of 1925 has been $5,638,238. Of the total gold in 1925, 61 per cent came from placers, 19 per cent from siliceous ore, 13 per cent from copper ore, and the remainder from lead, lead-zinc, copper-lead, and zinc ores.

Silver.—The total mine production of silver in Idaho for the period 1863 to 1925, inclusive, amounts to 282,156,793 fine ounces.

Shoshone County produced 86.5 per cent of the total silver in 1925, against 86 per cent in 1924. Lead ore yielded 61.9 per cent of the output, lead-zinc ore 24.2 per cent, and copper ore 9.2 per cent. Crude ore shipped, which yielded on the average 21.43 ounces of silver to the ton, supplied 17.5 per cent of the silver, and concentrates, which yielded 23.87 ounces of silver to the ton, supplied more than 82 per cent.

MICHIGAN

The copper mines of Michigan produce silver mainly from the electrolytic treatment of copper.

MONTANA

Gold.—The placer output of gold in Montana was $39,385, an increase of $12,024. Madison County had the largest placer output, $10,949, nearly all of which was recovered in Alder Gulch. Jefferson County produced $260,686, mostly from gold ore, and Silver Bow County $748,152, chiefly from copper-silver ores and lead-zinc ores. At amalgamation and cyanidation plants $258,275 in gold was recovered, an average of $2.27 per ton of ore and tailings treated. Ore treated at concentration mills resulted in concentrates yielding $1,122,303, or 76 cents a ton, and crude ore shipped to smelters yielded $267,161 in gold, an average of $1.72 a ton.

Silver.—Copper ore from Montana mines yielded 8,656,401 ounces of silver in 1925 (an average of 2.71 ounces a ton), of which Silver Bow County (Butte) supplied 8,630,438 ounces. The lead-zinc ore yielded 2,688,845 ounces. The dry and siliceous ores yielded 591,369 ounces, of which Silver Bow County supplied 199,578 ounces from silver ore.

NEVADA

Gold.—The mine production of gold in the Comstock district of Nevada in 1925 was $1,196,946, against $1,108,743 in 1924. Nye County produced $874,322, of which $683,623 came from Tonopah, where there was a decrease of $478,370. Siliceous ore yielded 140,878.25 fine ounces and copper ore 35,515.84 ounces.

Silver.—Nye County (almost wholly the Tonopah district) again led in the production of silver, with 3,098,513 ounces, or 1,931,312 ounces less than in 1924. All but 1,835,216 ounces of the State's output of silver came from dry and siliceous ores and 71 per cent of it was recovered by cyanidation. Lead ores yielded 1,361,753 ounces.

NEW MEXICO

Gold.—The mine production of gold in New Mexico in 1925 came mainly from Hidalgo County, which produced $222,823; Catron County, $163,322; Grant County, $98,792; and Colfax County, $52,658.

Copper ore yielded 15,636 ounces of gold, against 12,626 ounces in 1924, and dry and siliceous ore yielded 10,598 ounces. The output from lead ore was 157 ounces; from copper-lead ore, 2 ounces; and from lead-zinc ore 70 ounces, and the placer output was 98 ounces.

Silver.—Catron County produced 449,699 fine ounces of silver, all from siliceous ore, and Hidalgo County produced 136,568 fine ounces, mainly from copper ore. Siliceous ore yielded 476,904 ounces; copper ore, 163,561 ounces; and lead and copper-lead ores, 87,186 ounces. The output of silver from Grant County increased from 43,064 ounces in 1924 to 80,319 ounces in 1925.

OREGON

Gold.—The placer mines in Oregon produced $186,819 in gold in 1925, or $138,763 less than in 1924. Of the output from lode mines, which produced $205,590—a decrease of $20,670—96 per cent was obtained from siliceous ore. One dredge in Baker County and one dredge in Grant County produced $137,282, and a few drift and hydraulic mines and surface placers in Baker, Coos, Curry, Douglas, Grant, Jackson, Josephine, Malheur, Marion, and Wheeler Counties produced the remainder of the placer gold. Baker and Grant Counties produced $181,251 and $111,607 in gold, respectively.

Silver.—Of the total production of silver, 29,721 ounces came from siliceous ore, 1,941 ounces from copper ore, and 1,131 ounces from placer bullion.

SOUTH DAKOTA

The total value of gold produced in South Dakota from 1876 to the end of 1925 was $255,259,955, and the total output of silver for the same period was 7,310,742 fine ounces.

Gold.—The mine production of gold in South Dakota in 1925 was derived almost wholly from siliceous milling ore of low grade. About 67.6 per cent of the output was recovered by amalgamation and the

remainder largely by cyanidation. The Homestake mines and mills produced $5,999,073 in gold bullion from 1,589,701 tons of ore treated.

Silver.—The mine output of silver, 96,133 ounces, was derived from refining the gold bullion produced.

SOUTHERN APPALACHIAN AND EASTERN STATES

Gold.—The total production from 1799 to the end of 1925 in the southern Appalachian States, as shown from data compiled by the Bureau of the Mint, the United States Geological Survey, and the Bureau of Mines, has been $51,111,928. The data credit Alabama with $766,746, Georgia with $17,840,057, Maryland with $71,405, North Carolina with $23,658,441, South Carolina with $5,182,305, Tennessee with $294,758, and Virginia with $3,298,216.

The mine production of gold in the southern Appalachian States in 1925 was $35,712, against $12,111 in 1924. North Carolina led and Georgia was next. The gold produced in Tennessee (358.99 ounces) was derived from copper ore of the Ducktown district. The gold produced in Pennsylvania (237.04 ounces) was derived from copper concentrates from pyritiferous magnetite ore. Siliceous ore, mainly from North Carolina and Georgia, yielded 1,356.67 ounces. The production of gold from placers amounted to 11.90 ounces.

Silver.—Copper ore in Tennessee yielded 102,949 ounces of silver in 1925, copper concentrates from pyritiferous magnetite ore in Pennsylvania yielded 3,120 ounces, and siliceous ore yielded only 159 ounces.

TEXAS

The total output of gold from Texas mines from 1885 to the end of 1925 is given by Charles W. Henderson as $44,409, and the output of silver for the same period has been 18,540,043 ounces.

Gold.—The small yield of gold has been mainly a by-product.

Silver.—The silver produced in Texas in 1925 (552,000 ounces) came from the Presidio mine.

UTAH

Gold.—The total output of gold in Utah from 1864 to the end of 1925 is given by V. C. Heikes as $114,089,441.

In 1925 the Bingham district, in Salt Lake County, produced $2,336,932; the Tintic district, in Juab and Utah Counties, $828,028; and the Park City region, in Summit and Wasatch Counties, $353,401. The output recovered by amalgamation was about $393. Forty-nine per cent of the Utah gold was derived from copper ore, mined mainly in Salt Lake County; lead and lead-zinc ores yielded 31.7 per cent, siliceous ore 19.3 per cent, and copper-lead and copper-lead-zinc ore 5 ounces.

Silver.—The total output of silver in Utah from 1864 to the end of 1925 has been 491,424,010 fine ounces, according to V. C. Heikes. In 1925 the largest production was made in Juab County, credited with 5,654,551 ounces, mainly from lead ore and silver ore, against 4,285,995 ounces in 1924. Utah County had 3,877,688 ounces,

mostly from lead and siliceous ores, against 3,995,901 ounces in 1924. Of the Salt Lake County output of 3,689,623 ounces, the Bingham district produced 3,433,478 ounces. The Tintic district, in Juab and Utah Counties, produced 9,499,425 ounces, nearly all from lead and siliceous ores; and the Park City region, in Summit and Wasatch Counties, produced 7,236,652 ounces, all from lead, siliceous, and lead-zinc ores. Altogether in 1925 the lead ore of Utah yielded 10,318,309 ounces of silver; copper ore, 959,790 ounces; lead-zinc ore, 5,560,054 ounces; and dry and siliceous ore 4,434,524 ounces. The crude ore smelted in 1925 yielded 12,004,986 ounces, and concentrates 7,265,841 ounces.

WASHINGTON

The total production of gold in Washington from earliest mining to the end of 1925 is given by C. N. Gerry as $29,324,460, and the total production of silver as 8,777,445 ounces.

Gold.—Of the mine production of gold in Washington in 1925, 59 per cent was derived from ore shipped directly to smelters and 39 per cent from gold and silver milling plants; siliceous ore supplied 97.64 per cent, and copper, lead, zinc, and lead-zinc ores less than 2 per cent. Ferry County alone produced $133,809 in 1925 against $280,751 in 1924. Virtually all the gold produced in Ferry County in 1925 came from mines in the Republic district. Whatcom County produced $90,800 in gold.

Silver.—Of the mine production of silver, Ferry County produced 41,710 ounces, mainly from siliceous ore, and Stevens County 108,206 ounces, from copper ore and lead ore.

WYOMING

The total production of gold in Wyoming from 1867 to the end of 1925 has been $1,237,624, and the output of silver for the same period 70,113 ounces.

None of the mines in Wyoming reported any output of gold or silver for 1924 or 1925.

PHILIPPINE ISLANDS

Gold.—The output of gold in the Philippine Islands from 1907 to 1925, inclusive, has been $19,759,414. The production during the last 10 years has been as follows:

1916	$1,514,200	1921	$1,313,096
1917	1,408,161	1922	1,526,400
1918	1,290,000	1923	1,686,327
1919	1,309,722	1924	1,651,796
1920	1,276,561	1925	1,945,990

The yield of gold in 1925 from lode mines producing siliceous ore was $1,825,807. The gold derived from placers amounted to $120,183.

An article [2] has been published giving considerable data on operations by the Benguet Consolidated Mining Co., the Balitoc Mining Co. (formerly known as the Acupan mines), the Itogan Mining Co., and the Ukap Mining Co., as well as development work at the Douglas, Comote, Kelly, and other mines and properties.

[2] Eye, C. M., Philippine gold mining in 1926: Eng. and Min. Jour., Mar. 5, 1927, p. 414.

The annual report of the Benguet Consolidated Mining Co. for 1925 states that 92,700 tons of ore (3,079 tons more than in 1924) was cyanided, yielding $15.94 a ton in gold and silver. The bullion recovered was $1,463,735. The ore reserves were estimated to be 83,367 tons at the end of 1925. The capacity of the mill is 200 tons a day, the net profit from operations in 1925 was $779,266, and the dividends paid amounted to 55 centavos a share on a capital stock of 2,000,000 shares.[3]

Silver.—The mine production of silver in the Philippine Islands in 1925 was recovered entirely from gold bullion refined, as no attempt was made to develop the known deposits of silver ore. The quantity of silver derived from bullion in 1925 was 66,000 fine ounces.

NUMBER OF PRODUCING MINES

The following table indicates the number of mines that produced gold and silver in 1925. The placers are those in which the gold and the silver that is in natural alloy with the gold and, in a few placers, with platinum also are recovered from gravel and sand, whether by hand washing, sluicing, hydraulicking, drifting (in frozen ground or ancient buried river channels), or dredging. The lode mines are those producing gold and silver (from ore as distinguished from gravel) mainly from underground workings, including those whose ore is valuable chiefly for copper, lead, or zinc but which contribute precious metals as by-products. In addition to producing mines here enumerated, many properties were being prospected and developed, and many other mining claims were being held by assessment work only.

The enumeration of placer mines is less satisfactory than that of lode mines, because some of the operations are only temporary and individually small and because much of the production is made by transitory miners not regularly working placer ground. The unit so far as possible is, as for lode mines, not the operator but the mining claim or group of claims.

Number of mines in the United States producing gold and silver in 1925 [a]

State or Territory	Placer	Lode	Total	State or Territory	Placer	Lode	Total
Alaska	508	30	538	New Mexico	12	92	104
Arizona	18	368	386	North Carolina	2	2	4
Arkansas [b]	----	1	1	Oregon	94	53	147
California	359	332	691	Pennsylvania [b]	----	1	1
Colorado	30	412	442	South Dakota	----	3	3
Georgia	1	4	5	Tennessee [b]	----	2	2
Idaho	85	190	275	Texas	----	1	1
Illinois [b]	----	3	3	Utah	----	179	179
Michigan [b]	----	1	1	Virginia [b]	----	1	1
Missouri [b]	----	3	3	Washington	9	37	46
Montana	93	331	424				
Nevada	25	399	424		1,236	2,445	3,681

[a] Philippine Islands and Porto Rico excluded.
[b] Number of mines contributing to production of gold and silver.

[3] Engineering and Mining Journal-Press, Apr. 10, 1926.

Number of mines in the United States producing gold and silver, 1916–1925

Year	Placer	Lode	Total	Year	Placer	Lode	Total
1916	1,530	3,765	5,295	1922	1,359	2,206	3,565
1917	1,552	3,811	5,363	1923	1,295	2,188	3,483
1918	1,414	3,287	4,701	1924	1,095	2,032	3,127
1919	1,105	2,460	3,565	1925	1,236	2,445	3,681
1920	1,012	2,331	3,343				
1921	1,357	1,967	3,324	Average	1,296	2,649	3,945

The total number of properties operated in 1925 was 264 less than the average for the last 10 years. Although the number of placer properties worked showed an increase of 141 compared with 1924, this was 1,080 less than the number operated in 1906. The general decline in number of placer operations is a natural result of the exhaustion of the rich gravel and of the acquisition of large areas of placer ground by dredge companies. The number of lode mines operated was 413 more than in 1924 and 204 less than the average for the last 10 years, and more lode mines were operated than in any other year since 1919.

The greatest increases in the number of lode mines operated in 1925 were in Arizona, California, Colorado, Idaho, Montana, Nevada, and Utah. The increase in the number of placer mines was mainly in California and Oregon.

ORE PRODUCTION, CLASSIFICATION, AND AVERAGE VALUE

The best index of lode mining is found in the quantity, metallic content, and value of ore mined, rather than in the number of mines or of operators. In the next table are given the production of ore from mines producing gold and silver and the average extraction value of precious metals per ton.

The classification adopted is necessarily arbitrary in part. The complex nature of western ores especially and the gradations from one well-recognized class to another render essential a fixed terminology. The dry and siliceous ores comprise gold and silver ores proper, as well as fluxing ores carrying considerable quantities of iron and manganese oxides and very small quantities of gold and silver, and precious metal-bearing ores carrying copper, lead, or zinc in quantities too low to classify them as copper, lead, zinc, or mixed ores. The distinction between gold and silver ores is not here made. The total number of silver mines and the total production of true silver ore are both comparatively small. The copper ores include those containing 2.5 per cent or more of copper, or less than this percentage in the great disseminated copper deposits of the West and in the Lake Superior ores; in general, the lead ores are those containing 4.5 per cent or more lead and the zinc ores are those containing 25 per cent or more of zinc, both irrespective of their precious-metal content; but ores of lower grades in lead and especially in zinc are treated profitably in many districts, and of course they are then classified as lead or zinc ores, as the case may be. The mixed ores are combinations of those enumerated.

The lead, zinc, and lead-zinc ores in many districts in the Eastern and Central States carry no appreciable quantity of gold or silver, and such ores are excluded from this report.

The total quantity of ore sold or treated annually from which gold or silver was produced decreased from the record of 68,000,000 tons in 1918 to 21,500,000 tons in 1921, and has increased steadily since that year; in 1925 the quantity was 61,553,616 tons. Copper ore sold or treated in 1925 increased about 2,300,000 tons, owing to the increased activities of the large mines. Lead-zinc ores increased 911,619 tons, or about 51 per cent. The only decrease in 1925 was in lead ores.

Arizona led in quantity of ore by more than 6,448,000 tons, as its output was mainly copper ore. Utah was second, owing to its copper, lead-zinc, lead, and siliceous ores. Nevada was third, with 80 per cent of its output copper ore, and Alaska fourth, with an output of which the larger part was dry and siliceous ore. Montana, New Mexico, California, Idaho, Colorado, and South Dakota followed in order of output. The bulk of the ore from Alaska, South Dakota, and Colorado was low-grade siliceous ore, and that from Idaho was mainly lead ore and lead-zinc ore. The larger part of the output of ore from Nevada was copper ore, and the production of siliceous ore was 221,531 tons less than in 1924. All the ore from Michigan was low-grade copper ore, and 94 per cent of the ore treated from New Mexico was copper ore.

Ore produced in the United States and average extraction value of gold and silver per ton in 1925 [1]

State	Dry and siliceous ores		Copper ore		Lead ore	
	Short tons	Average value	Short tons	Average value	Short tons	Average value
Alaska	3,573,540	$0.88	860,023	$0.52	247	$40.29
Arizona	124,990	8.92	20,634,428	.35	127,944	5.62
California	886,625	10.19	999,006	.83	18,208	9.24
Colorado	1,187,054	7.25	2,193	35.31	95,113	4.42
Georgia	8,100	1.19				
Idaho	18,135	9.40	51,004	10.82	1,088,564	3.07
Michigan [2]			144,156	.67		
Montana	194,691	6.15	3,190,841	2.09	118,062	3.55
Nevada	844,948	7.77	3,923,158	.21	94,769	11.47
New Mexico	58,862	9.34	3,172,291	.14	17,239	3.61
North Carolina	6,030	3.06				
Oregon	24,743	8.83	2,740	3.32		
Pennsylvania [3]			816,579	.40		
South Dakota	1,590,079	3.81				
Tennessee [4]			794,930	.10		
Texas	72,685	5.18			52	129.50
Utah	389,030	9.73	12,575,265	.20	699,361	11.04
Virginia	15	4.80				
Washington	15,383	16.56	19,500	1.47	11,518	4.78
	8,994,910	4.57	47,186,114	.42	2,271,077	6.20
Percentage	14.61		76.66		3.69	
1924:						
Total	8,979,113	5.21	44,887,379	.39	2,358,602	5.71
Percentage	15.38		76.88		4.04	

[1] Arkansas, Illinois, Missouri, Philippine Islands, and Porto Rico excluded; quantity of crude ore containing gold and silver not known.
[2] Includes only copper ore that yielded silver.
[3] Ore is pyritiferous magnetite yielding 17,584 tons of low-grade copper concentrates; value given is per ton of concentrate.
[4] Zinc and lead ores yielded no gold or silver.

Ore produced in the United States and average extraction value of gold and silver per ton in 1925—Continued

State	Zinc ore		Copper-lead and copper-lead-zinc ores		Lead-zinc ore		Total (short tons)
	Short tons	Average value	Short tons	Average value	Short tons	Average value	
Alaska							4,433,810
Arizona	305	$3.23	24,565	$6.83	15,150	$0.56	20,927,382
California	33,384	.81			1,456	12.39	1,938,679
Colorado	11,801		1,417	16.32	448,096	2.39	1,745,674
Georgia							8,100
Idaho	701	4.45	6,275	25.56	663,036	1.97	1,827,715
Michigan [2]							144,156
Montana	19,271	5.00	195,327	2.20	686,816	2.87	4,405,008
Nevada	2,274	2.66	125	18.90	61,865	4.18	4,927,139
New Mexico	97,726		327	4.80	12,121	.54	3,358,566
North Carolina							6,030
Oregon							27,483
Pennsylvania [3]							816,579
South Dakota							1,590,079
Tennessee [4]							794,930
Texas							72,737
Utah	324		576	5.02	814,691	5.48	14,479,247
Virginia							15
Washington	3,646	.15			240	23.54	50,287
	169,432	.79	228,612	3.44	2,703,471	3.37	61,553,616
Percentage	0.28		0.37		4.39		100.00
1924:							
Total	145,858	.14	219,874	3.83	1,791,852	3.14	58,382,678
Percentage	0.25		0.38		3.07		100.00

[2] Includes only copper ore that yielded silver.
[3] Ore is pyritiferous magnetite yielding 17,584 tons of low-grade copper concentrates; value given is per ton of concentrate.
[4] Zinc and lead ores yielded no gold or silver.

The value of the gold and silver recovered from sources other than siliceous ore and placer bullion in the United States (Philippine Islands and Porto Rico excluded) in 1925 was $43,834,932. Reports show that this gold and silver was derived from about 52,558,700 tons of base ores, which yielded an average of 83 cents a ton. Of this average only about 18 cents represents gold.

The average recovery from siliceous ore in 1925 was $3.25 in gold a ton, so that a ton of siliceous ore yielded 18 times as much gold as the average derived from a ton of ore of all other classes combined, and 21.2 times as much as was derived from a ton of copper ore which constituted about 77 per cent of the total quantity of ores containing gold and silver in 1925. For this reason it is hopeless to expect any large increase in the production of gold in the United States by reason of increase in the quantity of base ores mined, even though the quantity should be doubled.

In 1925 the lead ore of Utah showed an average recovery in gold and silver of $11.04 a ton, and that of Idaho, which produced nearly half of the total output of lead ore containing gold, only $3.07 a ton. In the output of ore considered as producing gold and silver, the proportion of dry and siliceous ore decreased slightly, being 14.61 per cent, compared with 15.4 per cent in 1924, and the proportion of lead ore decreased from 4.04 to 3.69 per cent and that of copper ore decreased from 76.9 to 76.7 per cent. The proportion of other

classes of ore increased from 3.7 per cent of the total in 1924 to 5.04 per cent in 1925, but this gain does not include the large increases in some lead-zinc ores which carry no gold or silver.

During the period 1906–1925 the peak of production of dry and siliceous ores was reached in 1916, though the proportion of such ores to the total was largest in 1906. The extraction value of these ores varies considerably in different years, depending to a large degree on the quantity of low-grade ores milled in Alaska and South Dakota, which aggregated more than 57 per cent of the siliceous ores treated in 1925. The decided decrease in the average extraction value of gold and silver in copper ore—from $1.55 a ton in 1906 to 42 cents in 1925—was caused by the low gold and silver content in the greatly increased quantity of copper ore derived from mines in Arizona, New Mexico, Nevada, and Utah. As silver predominates over gold in most of the lead ore, the average extraction value shows a wider range than the quantity of ore. Zinc ore formed less than 1 per cent of the total ore given in the following table, and its average extraction value in precious metals shows a considerable range. The lead-zinc ores yielded an average of only 40 cents a ton in gold, but contained more than 4 ounces of silver a ton. The copper-lead and copper-lead-zinc ores have been negligible in quantity, though increasing since 1921, but they show a higher average extraction value than ore of any other class.

Ore produced in the United States and average extraction value of gold and silver per ton, 1916–1925 [1]

Year	Dry and siliceous ores		Copper ore		Lead ore	
	Short tons	Average value	Short tons	Average value	Short tons	Average value
1916	12,921,268	$5.73	47,478,127	$0.51	2,373,579	5.95
1917	12,166,026	5.56	49,049,181	.49	2,494,077	6.88
1918	9,702,240	6.58	53,409,729	.50	2,356,585	8.24
1919	9,302,229	6.25	29,919,369	.61	1,815,243	9.33
1920	8,590,139	6.26	32,447,410	.52	2,368,619	8.26
1921	8,436,214	6.65	10,930,888	.54	2,053,575	7.89
1922	8,728,222	6.98	23,356,128	.56	2,123,673	8.24
1923	9,121,719	5.91	41,596,309	.42	2,287,494	7.56
1924	8,979,113	5.21	44,887,379	.39	2,358,602	5.71
1925	8,994,910	4.57	47,186,114	.42	2,271,077	6.20

Year	Zinc ore		Copper-lead and copper-lead-zinc ores		Lead-zinc ore		Total (short tons)
	Short tons	Average value	Short tons	Average value	Short tons	Average value	
1916	833,345	$1.21	79,992	$5.54	2,702,091	$2.31	66,388,402
1917	641,755	.90	31,675	14.58	2,793,613	2.82	67,176,327
1918	210,298	.76	15,698	16.19	2,352,350	3.47	68,046,900
1919	88,654	.52	17,632	15.97	1,365,945	4.91	42,509,072
1920	482,229	3.00	26,890	30.01	1,443,904	4.10	45,359,191
1921	10,116	.76	14,248	31.76	122,287	16.96	21,567,328
1922	471,172	3.68	52,370	13.76	444,845	7.89	35,176,410
1923	723,994	2.55	162,181	7.30	1,203,698	3.39	55,095,395
1924	145,858	.14	219,874	3.83	1,791,852	3.14	58,382,678
1925	169,432	.79	228,612	3.44	2,703,471	3.37	61,553,616

[1] Arkansas, Illinois, Missouri, Philippine Islands, and Porto Rico excluded. Crude ore containing gold and silver not known

MINE PRODUCTION OF GOLD, BY SOURCES

As shown in the following table, 80.2 per cent of the domestic output of gold in 1925 was obtained from dry and siliceous ores—normally gold quartz and gold-silver quartzose ores—and from placers. The total contribution of gold derived from the great copper, lead, and zinc mines of the country is relatively small, notwithstanding their recent enormous development and production of ore, but this contribution in 1925 was considerably greater than in 1924 owing to the large quantities of base ores, especially copper ores and lead-zinc ores, treated.

Mine production of gold in the United States in 1925, by States, in fine ounces [1]

State or Territory	Placers	Dry and siliceous ores	Copper ore	Lead ore	Zinc ore	Copper-lead and copper-lead-zinc ores	Lead-zinc ore	Total
Alaska	155,912.62	150,045.46	1,585.64	134.87	------	------	------	307,678.59
Arizona	206.42	36,963.83	153,349.54	7,807.84	1.00	3,264.49	147.80	201,740.92
California	246,525.96	366,464.63	16,584.58	2,277.62	180.02	------	2.50	632,035.31
Colorado	7,271.63	321,538.90	1,936.51	2,616.01	1.14	98.85	16,144.16	349,607.20
Georgia	3.29	465.12	------	------	------	------	------	468.41
Idaho	12,692.92	4,054.53	2,785.20	1,048.63	2.03	26.31	277.30	20,886.92
Montana	1,905.25	38,081.43	32,352.64	2,393.79	165.91	2,113.50	5,110.33	82,122.85
Nevada	2,536.54	140,878.25	35,515.84	6,882.73	21.06	4.87	1,265.43	187,104.72
New Mexico	97.62	10,598.26	15,636.14	156.89	------	1.79	70.70	26,561.40
North Carolina	8.61	888.26	------	------	------	------	------	896.87
Oregon	9,037.38	9,570.36	375.06	------	------	------	------	18,982.80
Pennsylvania [2]	------	------	237.04	------	------	------	------	237.04
South Dakota	------	289,747.10	------	------	------	------	------	289,747.10
Tennessee	------	------	358.99	------	------	------	------	358.99
Utah	------	34,269.82	87,168.24	27,002.58	------	5.11	29,357.33	177,803.08
Virginia	------	3.29	------	------	------	------	------	3.29
Washington	52.87	10,876.19	139.80	57.43	3.50	------	8.70	11,138.49
	436,251.11	1,414,445.43	348,025.22	50,378.39	374.66	5,514.92	52,384.25	2,307,373.98
Value	$9,018,111	$29,239,182	$7,194,320	$1,041,414	$7,745	$114,003	$1,082,879	$47,697,654
Percentage	18.91	61.30	15.08	2.18	0.02	0.24	2.27	100.00
1924: Total	150,720.16	1,602,468.69	310,413.22	39,946.79	226.79	1,995.29	38,560.53	2,444,331.47
Value	$9,317,213	$33,125,968	$6,416,811	$825,773	$4,688	$41,246	$797,117	$50,528,816
Percentage	18.44	65.56	12.70	1.63	0.01	0.08	1.58	100.00

[1] Philippine Islands and Porto Rico excluded.
[2] From pyritiferous magnetite ore.

During the period 1916–1925 dry and siliceous ores yielded 63.9 per cent of the total output of gold; placer mining, 24 per cent; copper ore, 8.9 per cent; and all other ores, 3 per cent. It is evident that there can be no great increase from the miscellaneous base ores. The yield from copper ore may continue to increase, but no probable gain will bring the output of gold from copper ore to more than $7,000,000 or $7,500,000.

The yield of gold from placers in 1925 was less than half that of the average of the years 1906–1916, and though there may be spasmodic increases during the next few years, it is certain that the output from this source will decline, owing to the steady exhaustion of ground capable of being worked with dredges. Apparently any large increases in the yield of gold must come from dry and siliceous ores, which have yielded two-thirds of the output in the last 20 years. As

the production from these ores has decreased more than 50 per cent since 1915, and as no new large bodies of ore of this class have been discovered, there is apparently no reason to expect that the annual yield of gold from mines in the United States will exceed $50,000,000 to $55,000,000, and it may be considerably less.

Gold produced in the United States, by sources, as reported by mines, 1916–1925, in fine ounces [1]

Year	Placers	Dry and siliceous ores	Copper ore	Lead ore	Zinc ore	Copper-lead and copper-lead-zinc ores	Lead-zinc ore	Total
1916	1,106,901	2,795,764	401,127	71,922	8,302	4,452	28,539	4,417,007
1917	1,023,062	2,416,985	341,117	68,464	6,085	4,474	37,022	3,900,209
1918	758,202	2,045,495	309,018	55,246	1,188	1,431	42,093	3,212,673
1919	704,377	1,780,567	186,701	41,945	86	1,043	38,563	2,753,282
1920	603,002	1,523,331	171,055	46,776	3,657	3,731	31,435	2,382,987
1921	677,435	1,548,251	52,765	61,924	76	159	4,400	2,345,010
1922	537,910	1,560,789	130,928	35,415	2,807	2,467	22,935	2,293,251
1923	551,929	1,510,098	271,690	38,109	3,321	3,801	25,965	2,404,913
1924	450,720	1,602,469	310,413	39,947	227	1,995	38,560	2,444,331
1925	436,251	1,414,446	348,025	50,378	375	5,515	52,384	2,307,374

[1] Philippine Islands and Porto Rico excluded.

PLACERS

General features.—The States showing a considerable increase in placer gold in 1925 were California (24,563 ounces), Nevada (1,213 ounces), and Montana (582 ounces). The largest decreases were in Alaska (16,496 ounces), Colorado (12,974 ounces), Oregon (6,713 ounces), and Idaho (4,631 ounces).

The placer gold is derived chiefly from dredging (which yielded 76.6 per cent of the total in 1925), from drift mining (which is of decreasing importance in Alaska in frozen ground at no great depth but of continued importance in California in ancient buried river channels, in places at considerable depth), and from hydraulic and sluicing placers. Finally, there is a small annual output of gold from dry placers in the Southwest and also of gold and platinum from ocean-beach mining in California and Oregon.

Dredging.—The value of gold produced by dredging in the United States from the commercial beginning of the industry in 1896 to the end of 1925 has amounted, according to the best available data, to $203,596,502, of which $145,121,297 came from California, $29,859,474 from Alaska, $9,592,435 from Montana, $7,925,143 from Colorado, $5,638,238 from Idaho, $4,859,810 from Oregon, and $600,105 from other States. The production of gold from dredges in 1925 was $81,953 less than in 1924, and the number of dredges operated was three less. Further information, especially for earlier years, is to be found in previous issues of Mineral Resources, in reports of the Director of the Mint, and in reports of geological surveys or mining officials of different States.

Gold produced in the United States by dredges, 1916–1925

Year	Dredges	California	Alaska	All other States [1]	Total
1916	113	$7,769,227	$2,679,000	$2,338,487	$12,786,714
1917	109	8,313,527	2,500,000	1,736,898	12,550,425
1918	93	7,431,927	1,425,000	1,485,173	10,342,100
1919	91	7,716,919	1,360,000	1,269,297	10,346,216
1920	78	6,900,366	1,129,932	1,256,158	9,286,456
1921	72	7,756,787	1,582,520	1,196,261	10,535,568
1922	71	4,999,215	1,767,753	922,300	7,689,268
1923	66	6,065,735	1,848,596	1,084,716	8,999,047
1924	63	4,305,521	1,563,361	1,044,099	6,912,981
1925	60	4,750,842	1,572,312	507,874	6,831,028

[1] Colorado, Idaho, Montana, Oregon, New Mexico, Nevada, South Dakota, Wyoming, Washington.

Of the output in 1925 California produced $4,750,842 from 25 dredges, Alaska $1,572,312 from 27 dredges, Idaho $229,489 from 2 dredges, Colorado $141,103 from 4 dredges, and Oregon $137,282 from 2 dredges. Dredges operated in the Phillippine Islands in 1925 produced $120,183 in gold and about 940 ounces of silver.

DRY AND SILICEOUS ORES

The siliceous ore comprises free-milling (amalgamating) ore, as in Alaska, California, and Oregon; both amalgamating and concentrating ore, as in many States; simply concentrating ore, as in parts of Colorado and Arizona; all-sliming and cyaniding ore, as in Nevada; and finally smelting ore. Tailings both from old dumps and from present millings are largely reworked by concentration and subsequent cyanidation or smelting. The material smelted consists mainly of concentrates and of siliceous and pyritic ores, which are also valuable as fluxes. Figures of relative output by methods and by States are given on page 762.

As most of the gold produced in the United States is derived from placer gravel and dry and siliceous ores, including true gold, gold-silver, and silver ores, the following table for certain States, prepared by V. C. Heikes, is of special interest:

Gold produced in six Western States, 1919–1925

Year	Number of producers	Ore mined (short tons)	Total gold, including placer production (fine ounces)	Gold ore			
				Number of producers	Short tons	Gold content (fine ounces)	
						Total	Average
Arizona:							
1919	339	13,727,403	217,997.72	34	190,069	125,188.13	0.66
1920	318	14,920,478	231,528.65	41	201,334	139,857.94	.69
1921	215	5,455,030	141,753.41	26	182,194	114,044.05	.63
1922	318	10,746,045	170,479.98	72	173,070	102,814.10	.59
1923	341	17,015,178	296,109.23	65	226,585	142,442.85	.63
1924	275	19,820,505	235,995.74	65	209,356	92,771.09	.44
1925	386	20,927,382	201,740.92	77	71,289	33,644.79	.47
Idaho:							
1919	210	1,457,395	34,502.89	31	44,537	21,989.06	.49
1920	163	1,958,401	23,490.42	17	38,534	13,708.33	.35
1921	225	1,514,447	26,399.73	29	47,174	13,710.44	.29
1922	248	1,436,884	24,255.46	36	21,580	8,734.16	.40
1923	231	1,763,520	37,124.28	47	21,953	6,247.99	.28
1924	220	1,711,988	26,921.80	39	17,886	5,646.12	.32
1925	275	1,827,715	20,886.92	50	13,853	3,678.39	.27
Montana:							
1919	457	4,183,594	107,856.32	87	130,922	56,301.56	.43
1920	457	5,241,615	89,550.11	60	98,307	38,284.51	.39
1921	445	1,324,801	71,631.91	104	96,504	41,684.11	.43
1922	393	4,385,878	80,145.62	77	161,900	42,695.72	.26
1923	382	5,743,535	85,079.43	78	217,307	48,277.86	.22
1924	388	4,652,482	97,854.16	110	154,942	57,701.18	.37
1925	424	4,405,008	82,122.85	98	149,721	34,351.64	.23
Nevada:							
1919	421	3,187,831	219,695.16	94	163,279	111,170.33	.68
1920	473	3,480,620	172,540.46	106	102,772	48,873.75	.48
1921	431	1,096,138	160,254.62	122	63,850	50,699.95	.79
1922	387	1,565,276	159,510.95	108	69,337	57,954.24	.84
1923	389	4,354,937	204,292.89	128	142,148	64,197.59	.45
1924	384	4,699,333	217,962.56	152	139,041	70,067.65	.50
1925	424	4,927,139	187,104.72	156	129,914	59,519.79	.46
Utah:							
1919	179	6,745,423	104,464.41	6	553	1,528.81	2.76
1920	164	6,800,180	97,454.15	3	19	85.00	4.47
1921	138	2,137,522	85,619.15	2	69	266.69	3.86
1922	154	5,560,034	111,110.36	4	36,624	15,924.48	.43
1923	150	12,752,998	148,824.86	9	17,903	9,333.57	.52
1924	138	13,640,618	146,486.85	8	2,129	2,268.12	1.07
1925	179	14,479,247	177,803.08	8	8,087	2,411.08	.30
Washington:							
1919	49	100,879	12,232.20	11	25,648	11,951.91	.46
1920	44	85,318	5,846.60	10	12,513	5,510.88	.44
1921	37	22,885	6,215.51	9	15,985	5,966.77	.37
1922	46	36,046	9,044.43	10	17,944	8,764.15	.49
1923	36	56,900	16,547.49	12	30,146	16,310.46	.54
1924	34	44,383	14,977.72	12	17,543	14,705.87	.84
1925	46	50,287	11,138.49	8	15,376	10,870.47	.71

Gold produced in six Western States, 1919–1925—Continued

Year	Gold-silver ore		Silver ore		Placers	
	Short tons	Gold (fine ounces)	Short tons	Gold (fine ounces)	Number of producers	Gold (fine ounces)
Arizona:						
1919	19,536	6,474.19	85,070	4,279.51	15	227.07
1920	1,177	236.75	78,190	9,423.34	8	220.93
1921	75	23.67	50,932	2,390.05	37	605.85
1922	2,031	1,351.19	71,185	4,249.82	33	579.58
1923	268,537	35,273.99	71,171	6,742.02	24	428.31
1924	8,291	4,857.81	22,108	3,001.16	9	151.85
1925	2,036	432.77	51,665	2,886.27	18	206.42
Idaho:						
1919	21	15.94	3,693	257.08	72	9,227.63
1920	5	9.55	1,272	88.49	49	5,505.76
1921	54	39.14	993	76.96	92	8,784.90
1922	257	193.81	3,929	156.97	94	8,899.64
1923	311	82.91	1,795	239.24	85	24,125.05
1924	17	30.86	1,357	131.45	79	17,324.10
1925	434	317.89	3,848	58.25	85	12,692.92
Montana:						
1919	118	61.58	90,646	7,926.41	62	14,097.92
1920	847	423.20	79,198	6,585.71	65	13,977.76
1921	1,401	715.66	67,001	4,978.18	97	10,988.91
1922	6,594	1,079.35	204,817	9,568.17	78	3,472.65
1923	275	394.11	124,671	6,071.84	78	1,972.68
1924	161	133.32	52,384	5,339.76	86	1,323.59
1925	1,209	276.45	43,761	3,453.34	93	1,905.25
Nevada:						
1919	68,874	28,478.76	551,414	54,358.94	37	6,399.43
1920	76,863	24,216.14	619,572	62,968.62	39	7,383.91
1921	60,365	18,969.68	543,345	63,625.31	61	17,566.99
1922	44,503	10,189.16	758,043	72,362.96	42	11,602.36
1923	551,504	39,417.45	678,318	63,579.46	35	3,941.83
1924	524,248	48,099.53	403,190	63,460.37	36	1,323.97
1925	424,077	46,224.28	290,957	35,134.18	25	2,536.54
Utah:						
1919	14,618	3,489.71	224,517	20,198.11		
1920	24,837	10,209.30	266,164	23,053.69	3	21.91
1921	33,616	11,769.97	342,787	17,517.44	4	20.03
1922	4,145	2,178.47	373,570	20,250.67	7	103.04
1923	23,722	3,095.32	304,800	20,285.62	4	25.49
1924	39,490	11,287.00	240,607	13,543.63	2	11.22
1925	119,337	22,081.90	261,606	9,776.84		
Washington:						
1919			3,438	65.02	7	60.32
1920			583	38.94	9	71.20
1921			4,214	48.61	11	148.66
1922			6,838	66.72	13	162.44
1923			3,353	38.46	6	73.09
1924			32	.28	4	33.77
1925			7	5.72	9	52.87

Nearly all the siliceous ore in three of the largest gold-producing States—Alaska, California, and South Dakota—yields only a small quantity of silver and is classed as gold ore. The siliceous ore from Colorado includes much silver and gold-silver ore.

Siliceous ore treated and gold recovered per ton of ore treated, 1916–1925

Year	Alaska		California		South Dakota		Colorado	
	Ore treated	Recovery per ton	Ore treated	Recovery per ton	Ore treated	Recovery per ton	Ore treated	Recovery per ton
	Short tons	*Ounce*	*Short tons*	*Ounce*	*Short tons*	*Ounce*	*Short tons*	*Ounce*
1916	3,548,798	0.081	2,192,078	0.262	1,870,721	0.193	2,057,452	0.412
1917	3,414,664	.065	2,018,003	.246	1,867,859	.191	1,996,590	.347
1918	2,095,577	.080	1,538,960	.261	1,781,569	.178	1,760,222	.322
1919	3,262,573	.068	1,212,142	.339	1,330,349	.177	1,667,076	.258
1920	3,413,736	.063	788,136	.439	1,356,098	.167	1,224,081	.257
1921	2,894,813	.064	902,566	.402	1,725,669	.185	1,230,172	.250
1922	2,513,455	.058	1,052,148	.414	1,751,454	.180	1,296,501	.221
1923	2,502,901	.045	925,659	.347	1,665,439	.186	1,166,470	.243
1924	3,127,876	.042	1,075,858	.364	1,674,720	.177	1,074,876	.344
1925	3,573,540	.042	886,625	.413	1,590,079	.182	1,187,054	.271

The quantity of siliceous ore treated in South Dakota in 1925 decreased, but the recovery of gold per ton was 12 cents more; the siliceous ore in California decreased about 189,000 tons, but the gold recovery per ton was about $1 more than in 1924. The quantity of siliceous ore treated in Alaska increased about 445,700 tons. The gold recovery in Colorado per ton was 0.073 ounce less than in 1924.

COPPER ORE

The gold obtained as a by-product in the treatment of copper ore showed an increase in 1925 of about $777,500, following an increase of $800,000 in 1924. This source of gold contributed a larger percentage of the total gold yield than in 1924. The largest producer of gold from copper ore was Arizona, followed by Utah, Nevada, Montana, California, and New Mexico.

LEAD ORE

More than 83 per cent of the gold in lead ores sold or treated in 1925 came from Utah, Arizona, and Nevada. The total production showed an increase of 26 per cent compared with the output in 1924.

LEAD-ZINC, ZINC, AND MIXED ORES

The production of gold from zinc, lead-zinc, copper-lead, and copper-lead-zinc ores in 1925 was 17,491 ounces more than in 1924. Colorado, Utah, and Montana produced nearly all the gold from lead-zinc ore and California and Montana produced most of the gold from zinc ore. Arizona and Montana contributed nearly all the gold from copper-lead ore.

MINE PRODUCTION OF SILVER, BY SOURCES

The mine production of silver in 1925 from the three chief sources—dry and siliceous ore, copper ore, and lead ore—was 80.84 per cent of the total, against 86.75 per cent in 1924. Lead-zinc ore yielded 17.36 per cent of the total, an increase from 11.27 per cent in 1924, and the combined yield of silver from placer bullion, zinc ore, and copper-lead and copper-lead-zinc ores was only 1.8 per cent of the total.

The production of silver as reported by the mines had increased pretty steadily from 1908 to 1916. A decline during the next three years was followed by partial recovery in 1920, another decline in 1921, a large increase in 1922, a considerable increase in 1923 until after the expiry of the Pittman Act followed by a large decrease in 1924, and a fair increase in 1925. The combined production of silver from lead and lead-zinc ores increased from 26,077,241 ounces in 1924 to 30,355,708 ounces in 1925. The recovery of silver from siliceous ore decreased about 3,288,200 ounces and was the smallest recovery for many years. The recovery from copper ores increased about 1,716,500 ounces. The total recovery of silver from base ores in 1925 was about 5,928,500 ounces more than in 1924.

Mine production of silver in the United States in 1925, by States, in fine ounces [1]

State or Territory	Placers	Dry and siliceous ore	Copper ore	Lead ore	Zinc ore	Copper-lead and copper-lead-zinc ores	Lead-zinc ore	Total
Alaska	24,144	67,186	596,607	10,322				698,259
Arizona	24	505,727	5,795,173	803,153	1,389	144,567	7,885	7,257,868
Arkansas							3,118	3,118
California	18,579	2,097,419	704,506	174,494	33,492		25,926	3,054,416
Colorado	1,899	2,829,038	53,902	527,478	51	30,373	1,064,199	4,506,940
Georgia		46						46
Idaho	2,812	124,911	711,874	4,791,497	4,432	230,584	1,877,329	7,743,439
Illinois [2]				3,000				3,000
Michigan			139,499					139,499
Missouri			6	83,334				83,340
Montana	405	591,369	8,656,401	532,219	133,587	555,365	2,688,845	13,158,191
Nevada	1,285	5,261,402	125,477	1,361,753	8,104	3,259	335,338	7,096,618
New Mexico	13	476,904	163,561	84,976	129	2,210	7,331	735,124
North Carolina		108						108
Oregon	1,131	29,721	1,941					32,793
Pennsylvania [3]			3,120					3,120
South Dakota		96,133						96,133
Tennessee			102,949					102,949
Texas		542,300		9,700				552,000
Utah		4,434,524	959,790	10,318,309		4,012	5,560,054	21,276,689
Virginia		5						5
Washington	11	43,083	37,131	77,618	702		7,880	166,425
	50,303	17,099,876	18,051,937	18,777,853	181,886	970,370	11,577,855	66,710,080
Value	$34,910	$11,867,314	$12,528,044	$13,031,830	$126,229	$673,437	$8,035,031	$46,296,795
Percentage	0.08	25.63	27.06	28.15	0.27	1.45	17.36	100.00
1924: Total	51,251	20,388,065	16,335,433	18,858,782	24,431	1,194,323	7,218,459	64,070,744
Value	$34,338	$13,660,004	$10,944,740	$12,635,384	$16,369	$800,196	$4,836,367	$42,927,398
Percentage	0.08	31.82	25.50	29.43	0.04	1.86	11.27	100.00

[1] Philippine Islands and Porto Rico excluded.
[2] From fluorspar-lead ores.
[3] From pyritiferous magnetite ore.

Silver produced in the United States, by sources, as reported by mines, 1916–1925, in fine ounces [1]

Year	Placers	Dry and siliceous ores	Copper ore	Lead ore	Zinc ore	Copper-lead and copper-lead-zinc ores	Lead-zinc ore	Total
1916	126,351	24,593,656	24,541,234	19,216,586	1,274,292	533,273	8,572,141	78,857,533
1917	118,604	21,489,465	20,314,233	19,096,474	549,656	448,042	8,645,038	70,661,512
1918	89,494	21,564,982	20,462,597	18,291,243	135,676	224,580	7,290,380	68,058,952
1919	78,401	19,043,515	12,880,624	14,351,293	39,480	232,157	5,273,990	51,899,460
1920	73,383	20,477,612	12,151,424	17,069,506	1,258,341	669,503	4,837,135	56,536,904
1921	81,375	24,117,251	4,782,538	14,912,990	6,163	449,417	1,983,222	46,332,956
1922	60,769	28,631,579	10,376,123	16,756,835	1,676,967	669,809	3,035,907	61,207,989
1923	57,752	27,636,947	14,684,333	20,139,928	2,171,186	1,348,025	4,317,503	70,355,674
1924	51,251	20,388,065	16,335,433	18,858,782	24,431	1,194,323	7,218,459	64,070,744
1925	50,303	17,099,876	18,051,937	18,777,853	181,886	970,370	11,577,855	66,710,080

[1] Philippine Islands and Porto Rico excluded.

PLACERS

The output of silver from the refining of placer gold in 1925 was 948 ounces less than in 1924. Of the total production 85 per cent came from Alaska and California.

DRY AND SILICEOUS ORES

About 31 per cent of the mine production of silver from dry and siliceous ores in 1925 came from Nevada (chiefly from the Tonopah and Comstock districts), 26 per cent from Utah (mainly from the Tintic district), and 16.5 per cent from Colorado. The only large increases in the quantity of silver from siliceous ore were in Colorado and Idaho, and there were substantial decreases in Nevada, Montana, California, Utah, Texas, Arizona, and Washington.

A large part of the silver from gold-silver siliceous ore is obtained with the gold by amalgamation and cyanidation in the mills, and the silver is then recovered by refining the mill bullion. Very little gold and silver ores are treated by flotation which is so extensively employed on base ores. It is estimated that only 485,000 tons of such ore was so treated in 1925. The remainder is produced by smelting the richer ore and refining the copper or lead bullion produced.

COPPER ORE

The silver produced from copper ore is obtained in the electrolytic refining of Lake and blister copper produced by smelting. The copper ore consists mainly of sulphides (except the Lake ore of Michigan, which consists of native metal in amygdaloid and conglomerate matrix), and a greater quantity contains chalcocite than chalcopyrite or cupriferous pyrite. The silver tenor of the extensive disseminated deposits of the Santa Rita district, N. Mex., and of Ely, Nev., is notably low, but similar deposits elsewhere add considerable quantities of silver.

In output of silver from copper ore Montana continued to lead, with a yield of 8,656,401 ounces in 1925 against 7,845,180 ounces in 1924. Arizona was next, with 5,795,173 ounces in 1925 against

5,101,837 ounces in 1924. The production from Montana comes mainly from Butte, that of Arizona chiefly from Bisbee and Jerome, that of Utah from Tintic and Bingham, and that of California from Plumas County. Of these districts, Bisbee well represents the disseminated type, Bingham produces from both lode and disseminated deposits, and the remainder produce silver chiefly from copper ore mined from deep lodes. Some silver is also produced in leaching copper ore.

LEAD ORE

The mine production of silver from argentiferous lead ore was nearly equal to that of 1924. The largest increases in 1925 were as follows: Utah, 381,353 ounces; Nevada, 268,324 ounces; Montana, 245,178 ounces; and Colorado, 147,842 ounces. The largest decreases were as follows: Idaho, 1,024,267 ounces; Arizona, 109,588 ounces; Washington, 21,682 ounces; and California, 13,604 ounces. The yield of Idaho is derived mainly from the silver-lead ore of the Coeur d'Alene region, that in Utah chiefly from the Park City and Tintic districts, and that in Colorado from Aspen, Leadville, and the San Juan region. Most of the output is obtained from the desilverization of lead bullion from smelting of western ores and concentrates.

ZINC, LEAD-ZINC, AND MIXED ORES

Silver from argentiferous zinc ore increased from 24,431 ounces in 1924 to 181,886 ounces in 1925. The output was mainly from crude zinc ore from California and Montana shipped to smelters. Silver from lead-zinc ore increased 60 per cent; it came chiefly from Utah, Montana, Idaho, and Colorado. The output of silver from copper-lead and copper-lead-zinc ores cames mainly from Montana, Idaho, and Arizona.

DISTRIBUTION OF PRODUCTION OF GOLD AND SILVER, BY METHODS OF TREATMENT

SUMMARY OF DISTRIBUTION

In the following table is given the production of gold and silver from ore, tailings, slag, etc., treated in 1925.

Distribution of gold and silver produced in the United States in 1925, by States[1]

State or Territory	Total quantity of crude ore, tailings, and slag, treated or sold in 1925 (short tons)	Ore, tailings, etc., to gold and silver mills				Concentrates from all sources		
		Ore (short tons)	Tailings, etc. (short tons)	Gold in bullion (fine ounces)	Silver in bullion (fine ounces)	Short tons	Gold (fine ounces)	Silver (fine ounces)
Alaska	4,433,810	3,546,707	26,788	[2] 124,024	[2] 21,153	82,809	27,589	466,723
Arizona	20,927,382	46,660	14,670	29,352	22,872	1,042,190	45,742	1,675,967
California	1,938,679	[3] 704,662	86,170	[4] 321,906	[4] 186,860	96,832	51,084	2,378,736
Colorado	1,745,674	898,488	[5]	252,602	46,451	164,299	70,512	2,239,878
Idaho	1,827,715	5,889		2,699	2,651	267,187	4,449	6,377,121
Montana	4,405,008	88,109	25,700	12,494	91,559	1,484,615	54,291	11,992,741
Nevada	4,927,139	813,850	3,432	134,396	5,081,167	429,740	37,458	1,317,299
New Mexico	3,358,566	54,328		10,233	439,189	167,283	4,786	34,244
Oregon	27,483	24,135	200	7,869	10,670	636	906	4,904
South Dakota	1,590,079	1,589,711	[6]	288,394	81,817			
Texas	72,737	72,685			542,300			
Utah	14,479,247	20		19	5	893,815	108,967	7,265,841
Washington	50,287	6,458		4,394	244	3,128	147	29,835
Eastern States	[7] 1,625,654	14,145		1,357	159	63,441	351	45,620
Total, 1924	61,409,460	7,865,847	156,960	1,189,739	6,527,097	4,695,975	406,282	33,828,909
	58,239,078	7,842,309	174,693	1,265,727	9,126,859	4,632,598	420,743	29,787,702

State or Territory	Ore and tailings to concentrating mills (short tons)	Crude ore to smelters			Ore leached, tailings and slag smelted, etc.		
		Short tons	Gold (fine ounces)	Silver (fine ounces)	Short tons	Gold (fine ounces)	Silver (fine ounces)
Alaska	840,625	19,690	153	186,239			
Arizona	16,821,081	2,983,537	124,817	5,501,702	1,061,434	1,624	57,303
California	887,622	167,863	12,395	465,040	92,362	124	5,201
Colorado	623,620	223,566	19,222	2,218,712			
Idaho	1,756,922	63,344	1,046	1,357,337	1,560		3,518
Montana	4,021,949	155,248	12,924	846,100	114,002	509	227,386
Nevada	3,966,538	139,303	12,686	680,673	4,016	28	16,194
New Mexico	3,106,339	197,899	11,445	261,678			
Oregon	2,741	407	1,170	16,088			
South Dakota		368	1,353	14,316			
Texas		52		9,700			
Utah	13,548,273	679,710	57,333	12,004,986	251,244	11,484	2,005,857
Washington	25,406	18,423	6,545	136,335			
Eastern States	1,158,645	452,864	245	60,449			
Total, 1924	46,759,761	5,102,274	261,334	23,759,355	1,524,618	13,769	2,315,459
	43,781,526	4,704,658	276,687	23,282,371	1,735,892	30,456	1,579,595

Exclusive of gold or silver as follows: From copper ore in Michigan and Missouri; from lead and lead-fluorspar ore in Illinois and Missouri; from lead-zinc ore in Arkansas; from siliceous ore in Philippine Islands and Porto Rico.

[1] Exclusive of bullion from concentrates amalgamated, figures for which are included under "Concentrates from all sources."

[3] Also 6,032 tons of concentrates from California were cyanided, yielding 17,616.54 ounces of gold and 4,696 ounces of silver. The figures are included under "Concentrates from all sources."

[4] Includes 23,451.64 ounces of gold and 5,389 ounces of silver from "high grade."

[5] Sands and slimes (264,700 tons) from ore and concentrates first treated by amalgamation were cyanided.

[6] Sands and slimes (1,567,555 tons) from ore first treated by amalgamation were cyanided.

[7] Includes low-grade pyritiferous magnetite ore from Pennsylvania.

The greatest output of ore, etc., was made in Arizona, Utah, and Montana, all notable for large yields of copper ore; in Idaho, a large producer of lead ore and lead-zinc ore; in Nevada, Alaska, and California, large producers of both copper and siliceous ores; in South Dakota and Colorado, large producers of siliceous ore; and in New Mexico, a large producer of copper ore.

Many gold and silver mills employ concentrating apparatus, and the concentrates they obtain are combined in the table with those

from straight concentrating mills under the heading "Concentrates from all sources." The gold and silver included in this item are recovered partly by amalgamation and cyanidation, although most of the concentrates are smelted.

The figures for the quantity of ore treated by concentration include the large quantities of copper, lead, zinc, and mixed ores whose concentrates are smelted primarily for these metals, the gold and silver being recovered in refining the copper and lead bullion and smelting the zinc residues. The quantity of concentrates produced and the recoverable gold and silver content represent not only the concentrates from these straight concentrating mills but also the comparatively small quantity from gold and silver mills.

The ore treated in straight concentration mills increased about 7 per cent in 1925, mainly because of the greater quantity of ore milled at copper mines in Arizona, New Mexico, Nevada, Utah, Alaska, California, and other States and at lead-zinc mines in Colorado, Idaho, and Utah. Seven mines in the United States produced 484,924 tons of gold-silver ore, which was treated by flotation and yielded 36,445 tons of concentrates.

About 76 per cent of the recoverable silver from concentrates produced came from Montana, Utah, and Idaho, and large quantities came from California, Colorado, Arizona, and Nevada.

The figures for the quantity and the recoverable precious-metal content of crude ore shipped from the mines direct to the smelters in general include the richer gold, silver, copper, lead, and mixed ores from which the gold and silver is eventually recovered by refining the copper or lead bullion that collects the precious metals in the smelting. Arizona produced 58 per cent of the ore directly smelted, and Utah and Arizona produced 74 per cent of the silver and 70 per cent of the gold recovered from crude ore smelted.

The old materials, mainly tailings and slags, re-treated (with which are included ore and tailings leached) are partly smelted, often for their fluxing as well as their metal value; but considerable quantities of old tailings are now concentrated and cyanided, and the impounding of mill tailings for future treatment, as well as because of legal requirements, has become a general practice. Most of the gold and silver derived from the old tailings is included under recoveries by amalgamation and cyanidation at gold and silver mills. The total quantity of ore leached in 1925 was 1,039,512 short tons from Arizona and 54,378 tons from Utah. Some ore was also leached in New Mexico. In addition to ore mined and leached, ore was leached in place in Utah and Nevada and the copper recovered by precipitation.

Gold and silver produced at mills in the United States and percentage of gold and silver recovered by smelting and from placers, 1916–1925 [1]

Year	Ore and tailings treated (short tons)	Bullion recovered from all sources (fine ounces)					
		Amalgamation		Cyanidation		Chlorination	
		Gold	Silver	Gold	Silver	Gold	Silver
1916	11,393,838	964,589	348,177	1,260,172	14,432,378	20,346	2,784
1917	11,076,211	828,681	288,791	1,169,478	11,535,747	9,102	283
1918	8,524,496	678,359	216,670	1,047,186	9,736,605	5,770	3,631
1919	8,668,507	839,761	279,793	685,330	7,163,726	----------	----------
1920	7,560,043	679,409	228,807	580,205	7,582,358	----------	----------
1921	7,429,125	765,397	207,877	559,352	7,414,275	----------	----------
1922	7,442,998	812,396	183,119	541,318	8,803,787	----------	----------
1923	7,657,613	683,274	179,527	607,415	10,044,388	----------	----------
1924	8,023,899	746,777	231,742	563,208	8,921,688	----------	----------
1925	8,022,807	753,313	214,790	476,599	6,360,571	----------	----------

Year	Percentage of gold and silver from all sources									
	Amalgamation		Cyanidation		Chlorination		Placers		Smelting [2]	
	Gold	Silver	Gold	Silver	Gold	Silver	Gold	Silver	Gold	Silver
1916	21.5	0.4	28.1	18.3	0.5	----------	25.0	0.2	24.9	81.1
1917	20.9	.4	29.5	16.3	.2	----------	25.8	.2	23.6	83.1
1918	20.7	.3	32.0	14.3	.2	----------	23.6	.13	23.5	85.3
1919	31.5	.5	28.5	13.8	----------	----------	25.6	.15	14.4	85.5
1920	28.5	.4	24.3	13.4	----------	----------	25.3	.13	21.9	86.1
1921	32.6	.45	23.9	16.0	----------	----------	28.9	.18	14.6	83.4
1922	35.4	.3	23.6	14.4	----------	----------	23.5	.1	17.5	85.2
1923	28.4	.3	25.3	14.3	----------	----------	22.9	.1	23.4	85.3
1924	30.6	.4	23.0	13.9	----------	----------	18.4	.1	28.0	85.6
1925	32.6	.3	20.7	9.5	----------	----------	18.9	.1	27.8	90.1

[1] Philippine Islands and Porto Rico excluded.
[2] Both crude ores and concentrates.

The dredges produced $81,953 less gold in 1925 than in 1924, and the combined placer yield from hydraulic, drift, and other surface mines was $217,149 less than in 1924. The percentage of the output of silver credited to the placers is insignificant. Arizona, California, Colorado, Nevada, and South Dakota ores yielded the larger part of the gold recovered by cyanidation, and the total decrease was mainly due to the large decline in recoveries by the cyanide process in Arizona and Nevada. The chlorination process has not been used in California since 1918.

GOLD AND SILVER PRODUCED AT MILLS, BY STATES

A large quantity of concentrates from sulphide ores is now smelted, and the increased application of the flotation process has resulted in decreased yield of gold and silver from cyanidation, as nearly all such concentrates are shipped to smelters.

The smelters are to be credited in 1925 with 27.8 per cent of the total output of gold and 90.1 per cent of the silver.

The bulk of the gold produced continues to come from the gold mills. As shown in the table, the proportion of gold recovered by amalgamation and cyanidation has increased from 49.6 per cent in 1916 to 53.3 per cent in 1925.

Gold and silver bullion produced at mills in 1925, by States[1]

State or Territory	Ore and tailings treated (short tons)	Bullion recovered from all sources (fine ounces)				Percentage of gold and silver from all sources in State			
		Amalgamation		Cyanidation		Amalgamation		Cyanidation	
		Gold	Silver	Gold	Silver	Gold	Silver	Gold	Silver
Alaska	3,573,495	144,833	63,958	1,749	763	47.1	9.2	0.6	0.1
Arizona	61,330	840	494	28,512	22,378	.4	------	14.1	.3
California	790,832	278,118	61,652	61,405	129,904	44.0	2.0	9.7	.4
Colorado	[2] 898,488	100,255	21,913	152,346	24,538	28.7	.5	43.6	.5
Idaho	5,889	2,431	1,932	267	719	11.6	.02	1.3	------
Montana	113,809	6,835	1,658	5,659	89,901	8.3	------	6.9	.7
Nevada	817,282	12,191	7,742	122,205	5,073,425	6.5	.1	65.3	71.5
New Mexico	54,328	2,600	457	7,633	438,732	9.8	.1	28.7	59.7
Oregon	24,335	4,003	4,805	3,866	5,865	21.1	14.7	20.4	17.9
South Dakota	[3] 1,589,711	195,865	49,812	92,529	32,005	67.6	51.8	31.9	33.3
Texas	72,685	----------	----------	----------	542,300	------	------	------	98.2
Utah	20	19	5	----------	----------	------	------	------	------
Washington	6,458	4,394	244	----------	----------	39.5	.1	------	------
Eastern States	14,145	929	118	428	41	47.3	.1	21.8	------
	8,022,807	753,313	214,790	476,599	6,360,571	32.6	.3	20.7	9.5
Value	----------	$15,572,382	$149,064	$9,852,176	$4,414,236	------	------	------	------
1924: Total	8,023,899	746,777	231,742	563,208	8,921,688	30.6	.4	23.0	13.9
Value	----------	$15,437,251	$155,267	$11,642,543	$5,977,531	------	------	------	------

[1] Philippine Islands and Porto Rico excluded.
[2] Also 264,700 tons of sands and slimes from ore and concentrates amalgamated were treated by cyanidation.
[3] Also 1,567,555 tons of sands and slimes from ore amalgamated were treated by cyanidation.

The great bulk of the ore treated was milled in Alaska, South Dakota, Colorado, Nevada, and California, and here the famous mines and mills of the Homestake, Mother Lode, Grass Valley, Treadwell, Cripple Creek, Tonopah, and Goldfield districts are especially noteworthy. Large numbers of smaller mills, however, mark the wide distribution of gold mining in these regions and in many other scattered districts.

The total yield of gold by amalgamation in the United States in 1925 was 367,031 ounces less than in 1911. The largest increases in 1925 were shown in Alaska, California, Montana, New Mexico, Oregon, and Washington, and there were decreases in Colorado, Idaho, Nevada, and South Dakota.

The output of gold by cyanidation was 967,478 ounces less than in 1915. There were small increases in the Eastern States, Alaska, and Idaho in 1925. The principal decreases were in Arizona, 52,277 ounces; Nevada, 26,118 ounces; Colorado, 4,319 ounces; New Mexico, 2,397 ounces; California, 2,129 ounces; and Montana, 993 ounces.

Nevada led in yield of silver by cyanidation, producing 80 per cent of the total, and the only notable gain was in California. The decrease in Nevada was 2,269,277 ounces.

Of the gold-producing States whose output is derived chiefly from milling ores, Alaska, California, Idaho, Montana, Oregon, South Dakota, and Washington still yield more gold by amalgamation than by cyanidation, but cyanidation produces more gold than amalgamation in Arizona, Colorado, Nevada, and New Mexico, and it produces more silver in Arizona, California, Colorado, Montana, Nevada, New Mexico, Oregon, and Texas. Only in Alaska, Idaho, South Dakota, and Washington did the recovery of silver by amalgamation

exceed that by cyanidation. Altogether amalgamation produced gold and silver valued at $15,721,446 from milling ores in 1925, against $14,266,412 produced by cyanidation, and for the first time in many years the value of the gold and silver produced by amalgamation exceeded that produced by cyanidation. The recovery of gold by amalgamation has decreased greatly, and that obtained by cyanidation in 1925 was only about one-third of that recovered in 1915. The silver recovered by cyanidation has decreased nearly 10,000,000 ounces during the same period.

QUICKSILVER AND POTASSIUM AND SODIUM CYANIDE USED IN CERTAIN STATES

For details of the use of quicksilver in the amalgamation milling process and of potassium cyanide and sodium cyanide in the cyanidation process the reader is referred to the mine reports for the several Western States. The consumption of quicksilver at mills treating ore, in dredging, and in other methods of placer mining is given in the separate chapters on quicksilver in Mineral Resources for 1917–1919.

The following tables were compiled by V. C. Heikes:

Quicksilver purchased for use at mills in five Western States, 1919–1925

State and year	Number of mills using quicksilver	Ore and tailings treated (short tons)	Quicksilver purchased (pounds)[1]	
			Total	Per ounce of gold and silver bullion
Arizona:				
1919	6	2,374	33	0.077
1920	4	1,688	56	.031
1921	9	1,215	68	.066
1922	17	2,375	48	.052
1923	12	1,567	107	.099
1924	13	1,611	30	.025
1925	13	1,490	50	.037
Idaho:				
1919	12	40,504	828	.0406
1920	9	38,556	737	.053
1921	14	44,545	355	.025
1922	13	21,523	411	.042
1923	20	21,117	250	.035
1924	15	17,337	320	.044
1925	19	4,512	185	.042
Montana:				
1919	17	13,142	178	.054
1920	11	27,989	250	.046
1921	13	2,562	47	.0225
1922	9	43,757	218	.025
1923	14	62,460	385	.046
1924	15	58,474	97	.015
1925	16	71,237	243	.029
Nevada:				
1919	21	60,038	1,149	.026
1920	21	41,700	631	.021
1921	23	13,143	224	.009
1922	22	10,875	522	.021
1923	27	25,354	690	.024
1924	25	19,912	584	.023
1925	31	16,141	600	.030
Washington:				
1921	3	2,930	227	.126
1922	1	8,886	75	.015
1923	2	5,628		
1924	2	1,611	325	.330
1925	1	6,458		

[1] Partly estimated.

Quicksilver used at mills in Colorado in 1925 amounted to 4,495 pounds (Colorado also consumed 200 pounds on gold dredges), in New Mexico to 100 pounds, and in South Dakota to 7,500 pounds. Dredges in California used about 7,000 pounds of quicksilver in 1925. The quicksilver used by other placers and at lode mines is estimated at 5,000 pounds, making a total of more than 12,000 pounds for California. The quantity of quicksilver used in Alaska is not known, but was probably about 10,000 pounds, and that in Oregon about 200 pounds.

Sodium cyanide consumed at mills in certain Western States, 1919–1925, in pounds [1]

State	1919	1920	1921	1922	1923	1924	1925
Arizona	99,605	219,569	293,597	259,506	330,666	135,971	84,600
Colorado	582,547	338,763	360,000	301,794	309,565	306,196	309,293
Idaho	950	1,600	11,391	4,701	3,900	950	3,900
Montana	64,900	105,874	108,665	291,910	274,218	84,770	54,684
Nevada	992,840	1,672,190	1,107,530	1,831,592	3,199,634	2,677,406	2,123,687
New Mexico	108,805	90,200	80,768	64,544	61,391	112,500	[2] 81,159
South Dakota	284,653	[2] 365,095	[2] 672,224	387,683	361,900	361,650	347,242
Texas	38,700	36,976	43,028	74,428	83,804	[2] 70,995	[2] 43,691
Utah	37,844	40,599	93,200	118,103	43,731	(3)	
Washington			100		50		
	2,210,844	[2] 2,870,866	[2] 2,770,503	3,334,261	4,668,859	[2] 3,750,438	[2] 3,048,256

[1] The consumption of potassium cyanide was 68,155 pounds in 1919 (17,884 pounds at mills in Arizona and 50,271 pounds at mills in Nevada), 7,825 pounds in 1920 (7,800 pounds at mills in Arizona and 25 pounds at mills in Washington), 5,626 pounds in 1921 (Arizona 4,200 pounds, Idaho 600 pounds, and South Dakota 826 pounds), and 6,610 pounds in 1922 (Arizona 3,550 pounds, Idaho 800 pounds, Montana 1,030 pounds, Nevada 230 pounds, Washington 1,000 pounds). In 1923 Nevada mines used 575 pounds, and in 1924 Nevada mines used 26,300 pounds.

[2] Includes some cyanamid which is reduced to the equivalent of 96 per cent NaCN.

[3] Quantity small; figures not available.

Potassium and sodium cyanide consumed at mills in six Western States, 1919–1925

State and year	Number of mills using cyanidation process	Ore and tailings treated (short tons)	Cyanide consumed (pounds) [1]		
			Total	Per ton of ore and tailings	Per ounce of gold and silver
Arizona:					
1919	8	211,199	117,489	0.56	0.49
1920	4	206,847	227,369	1.10	.85
1921	9	193,414	297,797	1.54	.21
1922	12	188,879	263,056	1.39	1.04
1923	10	242,652	330,666	1.36	.85
1924	7	146,904	135,971	.93	1.05
1925	6	59,840	84,600	1.41	1.66
Idaho:					
1919	3	907	950	1.05	2.07
1920	1	334	1,600	4.79	2.70
1921	4	2,658	11,991	4.51	2.12
1922	3	139	5,501		1.68
1923	3	784	3,900	4.97	5.30
1924	3	336	950	2.83	1.05
1925	1	1,377	3,900	2.83	3.96
Montana:					
1919	11	97,802	64,900	.66	.55
1920	8	60,999	105,874	1.74	1.84
1921	12	73,437	108,665	1.48	1.81
1922	14	113,687	292,940	2.58	2.59
1923	10	151,903	274,218	1.80	2.10
1924	9	39,776	84,770	2.13	.77
1925	6	42,572	54,684	1.28	.57

Potassium and sodium cyanide consumed at mills in six Western States, 1919–1925—Continued

State and year	Number of mills using cyanidation process	Ore and tailings treated (short tons)	Cyanide consumed (pounds) [1]		
			Total	Per ton of ore and tailings	Per ounce of gold and silver
Nevada:					
1919	30	614,190	1,043,111	1.70	.18
1920	33	640,690	1,672,190	2.61	.26
1921	19	617,790	1,107,530	1.79	.17
1922	28	833,025	1,831,822	2.20	.24
1923	32	1,246,003	3,200,209	2.57	.375
1924	25	965,995	2,703,706	2.80	.36
1925	16	801,141	2,123,687	2.65	.41
Utah:					
1919	1	14,571	37,844	2.60	.57
1920	1	23,682	40,599	1.71	.32
1921	1	33,616	93,200	2.77	.74
1922	1	33,247	118,103	3.55	1.25
1923	1	14,301	43,731	3.06	1.06
1924			[2]		
1925					
Washington:					
1920	1	8	25	3.13	1.04
1921	1	30	100	3.33	.19
1922	1	241	1,000	4.15	.34
1923	1	12	50	4.17	6.25
1924					
1925					

[1] Partly estimated.
[2] Quantity small; figures not available.

It has not been possible to obtain figures showing the total quantity of potassium cyanide and sodium cyanide used in the recovery of gold and silver in the United States in 1925. The estimated quantity used in California, 360,000 pounds; in Oregon, 30,000 pounds; in the Eastern States, 6,000 pounds; and in Alaska, 15,000 pounds, plus the 3,048,256 pounds reported to have been used in other Western States, indicates a total consumption of about 3,460,000 pounds at gold and silver mills. Considerable cyanide was also used at flotation mills, which is not included in the above estimate.

ACKNOWLEDGMENTS

To those engaged in the mining and metallurgic industries, to merchants, bankers, and transportation officials of the United States and Alaska, to the Bureau of the Mint, the Post Office Department, and the Bureau of Foreign and Domestic Commerce, and to other officials, public and private, who have cooperated with the Bureau of Mines by furnishing information on the production of gold and silver, acknowledgment is gratefully made. To the authors of the mine reports on the production of gold, silver, copper, lead, and zinc in the Western States the writer is especially indebted.

O